

DISSERTATION

**DEVELOPMENT AND EVALUATION OF *FOOD FRIENDS GET MOVIN' WITH MIGHTY MOVES*<sup>™</sup>, A PHYSICAL ACTIVITY PROGRAM TO PREVENT OBESITY IN LOW-INCOME PRESCHOOLERS**

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY LAURA BELLOWS ENTITLED DEVELOPMENT AND EVALUATION OF FOOD FRIENDS GET MOVIN' WITH MIGHTY MOVES™, A PHYSICAL ACTIVITY PROGRAM TO PREVENT OBESITY IN LOW-INCOME PRESCHOOLERS BE ACCEPTED AS FULFILLING, IN PART, REQUIREMENTS FOR A DOCTOR OF PHILOSOPHY.

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## ABSTRACT OF DISSERTATION

### **DEVELOPMENT AND EVALUATION OF *FOOD FRIENDS GET MOVIN' WITH MIGHTY MOVES™*, A PHYSICAL ACTIVITY PROGRAM TO PREVENT OBESITY IN LOW-INCOME PRESCHOOLERS**

The prevalence of overweight among preschool-aged children in the United States is increasing at an alarming rate. The preschool years provide an opportunity to establish healthful eating and physical activity behaviors which can lessen the growth of obesity. Unfortunately, preschoolers have been largely ignored when it comes to obesity prevention efforts.

The overall objective of this project was to design, develop, and evaluate a physical activity program to compliment the *Food Friends®* nutrition program in an effort to prevent overweight in young children. *Food Friends Get Movin' with Mighty Moves™* is an 18 week program focusing on gross motor development, physical fitness, and physical activity in the classroom environment. This project utilized the steps of social marketing to develop the *Mighty Moves™* program. Further, to enhance the likelihood that behavior change would occur, the Social Learning Theory was embedded within the social marketing framework.

The *Food Friends Get Movin' with Mighty Moves™* study was a randomized controlled trial of 3- to 5-year old children (n=201) enrolled in 8 Head Start centers in

Colorado. On-site measures included height, weight, physical fitness (sit-ups, sit-n-reach, shuttle run, 3-minute run), and gross motor skill (Peabody Developmental Motor Scales) assessments. BMI, BMI z-score and BMI percentiles were calculated. Additionally, physical activity was assessed by pedometers over a 6-day timeframe (4 weekdays and 2 weekend days), and daily step counts were recorded by parents.

Characteristics of the study population indicated a high prevalence of overweight, low physical activity levels, and average to below-average motor skills. The intervention did not have an effect on weight status but did improve gross motor skills and fitness levels. Lastly, no difference was found for physical activity by treatment.

The success of *Mighty Moves*<sup>™</sup> at increasing gross motor skills and physical fitness in preschoolers, in concert with the *Food Friends*<sup>®</sup> program's demonstrated ability to increase children's willingness to try new foods, has contributed to the establishment of healthful behaviors for proper growth and development in the early years. These behaviors serve as foundations to building healthy lifestyles, which may decrease the risk of overweight later in life.

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## CHAPTER 1

### PROJECT OVERVIEW

#### **Project Rationale**

Obesity is a leading public health concern. Throughout the United States, overweight and obesity have increased in people of all ethnic groups, all ages, and both genders.<sup>1</sup> Between 1980 and 2002, obesity prevalence doubled in adults aged 20 years or older and overweight prevalence tripled in children and adolescents aged 6 to 19 years.<sup>2</sup> Even our nation's preschoolers are affected. Among children ages 2 to 5, the prevalence of overweight has increased from 7 percent in 1994 to 10 percent in 2000 to almost 14 percent in 2004.<sup>1,2</sup>

Overweight and obesity have been grouped as one of the Leading Health Indicators in Healthy People 2010.<sup>3,4</sup> The nation's growing recognition of the obesity crisis as a major public health concern for our children and youth has led to an array of diverse efforts aimed at increasing physical activity and promoting healthful eating.<sup>5</sup> While the large majority of childhood obesity efforts have been focused at school-aged children, a large void exists in addressing obesity among preschool-aged children.<sup>6</sup> The high prevalence of overweight among preschool-aged children

suggests that greater attention should be paid to this population so that we can increase our understanding of the problem and ways it might be addressed.<sup>7</sup>

Good nutrition and physical activity are important to the growth, development, and emotional well-being of young children and to their establishment of healthful lifestyles that prevent childhood overweight. Healthful behaviors are fostered by stimulating and encouraging environments in which children live and play. Because many children spend much of their day in childcare centers, these centers play an important role by promoting an environment that encourages healthful eating and age-appropriate physical activity.<sup>6</sup>

*Food Friends – Making New Foods Fun for Kids®* is a multi-faceted awareness and education program designed to promote healthful habits, literacy, and skill building among at-risk preschool-aged children. This program has been successfully evaluated to ensure that changes in eating behavior are attained. *Food Friends®* promotes the importance of trying new foods to increase dietary variety consumed among these children. The program focuses on the children and secondary influencers - teachers and parents of preschoolers.<sup>8-15</sup>

Improving dietary behaviors is just one piece of the complex issue of childhood obesity with physical inactivity being the other major contributor. The addition of a comprehensive physical activity component to the *Food Friends®* program will enhance the program's overall efforts to establish healthy habits early in life.

Through enhancing preschoolers' gross motor skills, increasing their physical activity levels in the classroom and encouraging families to be more active, a

comprehensive approach to physical activity was offered. Thus, the *Food Friends Get Movin' with Mighty Moves™* program may play a role in slowing the epidemic of childhood overweight.

### **Project Objectives and Goals**

There were two project goals:

- 1) Determine if a physical activity program, in conjunction with an existing nutrition program, designed and developed for preschoolers can decrease the upward trajectory weight gain, as measured by body mass index (BMI).
- 2) Explore if the *Mighty Moves™* program improved physical activity, gross motor skills, and/or physical fitness levels of 3- to 5-year old children enrolled in Head Start.

The overall objective of this project was to design, develop, and evaluate a physical activity program to compliment the *Food Friends®* nutrition program in an effort to prevent obesity in low-income preschoolers. The development of the *Mighty Moves™* physical activity component utilized the six steps of social marketing: Initial Planning, Formative Research, Strategy Development, Program Development and Pretesting, Implementation, and Evaluation.<sup>16</sup> Individual objectives for each of these steps, and the timeframe in which they occurred, are outlined below.

#### ***Step 1: Initial Planning (February – April 2005)***

- Conduct a review of the literature on physical activity, motor skills, physical fitness, and obesity prevention efforts for preschoolers;

- Determine behavioral objectives for the physical activity component of *Food Friends*®.

## **Step 2: Formative Research (April – June 2005)**

### *Key Informant Interviews*

- Identify Head Start and preschool teachers barriers and motivators to implementing and promoting physical activity to preschool-aged children;
- Assess teachers' attitudes, opinions and interests in conducting physical activity in the classroom; learning characteristics; and occurrence of the targeted behaviors;
- Explore teachers' preferred mode of physical activity programming and materials; preferred means of education and information dissemination for families, and program name, concepts, and themes.

### *Focus Groups*

- Identify parents of Head Start and preschool children's barriers and motivators in implementing and promoting physical activity with their children;
- Gather parent's input on children's interests and current activities;
- Assess parents' attitudes, opinions and interest in conducting physical activity with their preschooler at home; learning characteristics; and occurrence of the targeted behaviors;
- Explore parents' preferred mode of physical activity programming and materials; preferred means of education and information dissemination for families, and program name, concepts, and themes.

**Step 3: Strategy Development (July – December 2005)**

- Develop a plan for the classroom component of *Mighty Moves*™ organized around marketing's conceptual framework of the four P's: Price, Place, Product and Promotion.

**Step 4: Program Development and Pretesting (January – September 2006)**

- Develop a physical activity program for low-income 3- to 5-year olds based on formative research and a review of current literature;
- Utilize tenets of social marketing and constructs of the Social Learning Theory in the development of *Mighty Moves*™;
- Pretest program name, graphics, strategy, and materials with the target audience – children and teachers. Note: Pretesting with parents was conducted as part of another student's project.<sup>17</sup> Additionally, pretesting outcome measures with preschool students was also conducted as other graduate students' projects.<sup>18-19</sup>

**Step 5: Implementation (September 2006 – April 2007)**

- Implement *Mighty Moves*™ in 8 Head Start centers - four urban and four rural- throughout Colorado who have previously implemented *Food Friends*®;
- Train classroom teachers prior to implementation;
- Provide teachers with program materials to conduct the 18-week program.

**Step 6: Evaluation (September 2006 – September 2007)**

- Gather preschoolers' height, weight, physical fitness level, gross motor skill ability at their Head Start during pre- and post-test;
- Collect physical activity data on children and parents via pedometers and a survey sent home through the Head Start at pre- and post-test;
- Ascertain teachers' opinions and feedback regarding program activities, components, and materials;
- Evaluate the effectiveness of the physical activity program in decreasing the upward trajectory of BMI in preschool-aged children;
- Explore the impact of the intervention on improving physical activity levels, physical fitness, and gross motor skills among children;
- Explore the relationship between children's BMI, gross motor skills, and physical activity levels.

Each of the six steps of the Social Marketing process are described, in full, in subsequent chapters, beginning with Initial Planning step's Literature Review (Chapter 2). The formative research and strategy development of *Mighty Moves*<sup>™</sup> are outlined in Chapter 3. Chapter 4 summarizes how the social marketing framework, including the exchange theory and the marketing mix (4 P's), was integrated into the strategy and program development of *Mighty Moves*<sup>™</sup>. Next, Chapter 5 outlines how the Social Learning Theory was applied to the classroom component, teacher training, and process evaluation instruments for *Mighty Moves*<sup>™</sup>. Descriptive statistics of the study population in relation to physical activity, physical fitness and gross motor ability as well as the relationships between

weight status, physical activity, physical fitness and gross motor ability are discussed in Chapters 6. Chapter 7 summarizes the outcome findings of the *Food Friends Get Movin' with Mighty Moves™* study. Lastly, Chapter 8 discusses the broader implications of this study, as well as lessons learned and future recommendations.

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## CHAPTER 2

### LITERATURE REVIEW

#### **I. Childhood Obesity**

##### **A. Prevalence**

The prevalence of overweight among preschool-aged children in the United States is increasing at an alarming rate. According to the World Health Organization, an estimated 17.6 million children under 5 are overweight worldwide, and nearly one in three children in the United States between 5 and 14 is overweight, compared to one in six 30 years ago.<sup>1</sup> According to the latest National Health and Nutrition Examination Survey (NHANES) data collected from 1999-2004, it is estimated that 13.9 percent of preschool-aged children in the United States are overweight and 26.2 percent are at risk for overweight.<sup>2</sup> Minority children appear to be at greatest risk; 19.2 percent and 13.0 percent of Mexican-American and African American 2- to 5-year olds, respectively, are overweight. In comparison, 11.5 percent of white children aged 2- to 5 are overweight.<sup>2</sup> The prevalence of overweight in Mexican American male children and adolescents is significantly greater than in non-Hispanic white male children and adolescents. Further, Mexican American and non-Hispanic black female children and adolescents are significantly more likely to be overweight compared with non-Hispanic white female children and adolescents.<sup>2</sup>

Overweight statistics for 2-5 year olds from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) show similar trends nationally to the National Health and Nutrition Examination Survey (NHANES) for overweight and overweight by ethnicity. Colorado WIC overweight statistics are below the national average, similar to obesity statistics for Colorado adults being below the national average.<sup>3-5</sup> Table 2-1 illustrates NHANES and WIC overweight data for preschool-aged children.

Table 2-1: *Prevalence of Overweight and At-Risk for Overweight for 2-5 year old children participating WIC and NHANES 2003-2004*<sup>2,4</sup>

	Number	Overweight ≥ 95%	At Risk for Overweight 85 - < 95%
<b>All</b>			
WIC National	2,822,660	14.8%	16.1%
WIC Colorado	35,758	9.7%	15.0%
NHANES	818	13.9%	26.2%
<b>By Ethnicity (CO WIC)</b>			
White	10,461	7.1%	13.9%
Black	1,457	6.7%	12.8%
Hispanic	18,384	11.0%	16.2%
<b>By Ethnicity (NHANES)</b>			
White	240	11.5%	25.0%
Black	258	13.0%	24.0%
Mexican American	228	19.2%	32.6%

Source: Colorado WIC program, NHANES 2003-2004<sup>4,5</sup>

## B. Risk Factors

### *Racial and Ethnic Differences*

As illustrated above with WIC and NHANES 2003-2004 data, obesity rates in preschoolers differ by race and ethnicity, mimicking adult and adolescent obesity rates.<sup>2</sup> Mei et al., using data from CDC's Pediatric Nutrition Surveillance System,

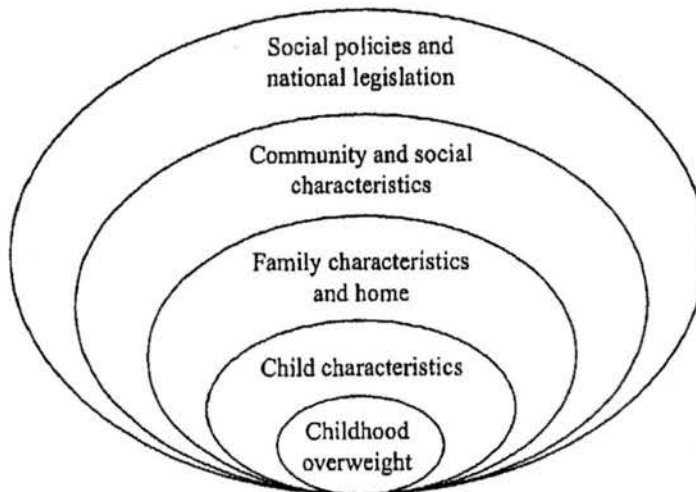
also found a higher prevalence among Hispanic low-income preschool-aged children compared to other race or ethnic groups.<sup>6</sup> The higher prevalence of overweight among Hispanic preschool children may be related partially to dietary, environmental, or genetic factors. Factors such as culturally determined food intake patterns, less avoidance of fat containing foods, and greater consumption of whole milk, suggests that Hispanic children may ingest more fat than do White children.<sup>7</sup> In addition, Hispanic and Black mothers often do not identify their overweight children as being overweight, indicating that culture may play a part in how mothers perceive their children's health status.<sup>7-12</sup>

In a sample of preschool children drawn from 20 large US cities, the high prevalence of obesity among Hispanics relative to blacks or whites was not explained by racial/ethnic differences in maternal education, household income, or food security.<sup>13</sup> Further, Kimbro et al. found White-Hispanic and Black-Hispanic differences in overweight prevalence rates were not explained by socioeconomic, health, and household, or parenting characteristics when compared to White, non-Hispanics. However, there was some evidence to suggest that Hispanic mothers, particularly those who are at lower levels of acculturation, may be more likely than would women in other groups to hold the common cultural belief that chubby children are healthier.<sup>7</sup> Rich et al. conducted interviews with 76 Hispanic WIC mothers with overweight children ( $\geq 95$  percent for BMI) regarding the health status of their child. Findings showed that the participants believed that their preschooler was "healthy" although their child was overweight, mainly because there was an absence of disease.<sup>12</sup>

## ***Environmental Factors***

Although many risk factors for obesity have been identified for school-age children, less is known about preschoolers. Ecological models have been developed to illustrate how individual characteristics, community-level factors, and policies may influence weight gain. Hawkins and Law used an ecological model (Figure 2-1) to review factors that influence overweight in children, aged six months to five years. Hawkins and Law found strong evidence for a direct association between childhood overweight and maternal pre-pregnancy body size, maternal smoking during pregnancy, and children's television/media use; strong evidence for an inverse relationship between breastfeeding and overweight, and moderate evidence for children's physical activity.<sup>14</sup> There was limited evidence on community-level factors, policies, and interventions.

Figure 2-1: *Influences on childhood overweight: a modified ecological framework*<sup>14</sup>



### **C. Health Implications**

By the time children reach school age, those who are overweight have a greater probability of being obese as adults.<sup>15, 16</sup> Research suggests that by 3 to 9 years of age, obese children demonstrate a five- to nine-fold increased likelihood of remaining obese into adulthood.<sup>17</sup> Twenty-six to 41 percent of obese adults were obese in preschool, and 42 to 63 percent were obese in elementary school.<sup>18</sup> Not only are obese children at increased risk for adult obesity, they are more likely than non-obese children to experience significant short-term health problems such as hyperlipidemia, hypertension, insulin resistance and respiratory problems.<sup>17</sup> Williams et al. found that obese preschoolers had approximately 3 times the risk of having high systolic blood pressure and twice the risk of low high-density lipoprotein cholesterol level compared with non-obese children, indicating that at-risk populations can be identified and primary prevention begun at a young age.<sup>19</sup>

#### ***Cardiovascular Disease***

Cardiovascular Disease (CVD) remains the leading cause of both death and disability in North America. Pathological data have shown that atherosclerosis begins in childhood and the extent of atherosclerotic change in children and young adults can be correlated with the presence of the same risk factors identified in adults.<sup>20</sup> Findings from the Bogalusa study indicate that as the number of cardiovascular risk factors increases, so does the pathological evidence for atherosclerosis in the aorta and coronary arteries beginning in early childhood.<sup>21</sup> The Council on CVD in the Young of the American Heart Association (AHA) thus suggests that it seems eminently reasonable to initiate healthful lifestyle training in childhood to promote improved cardiovascular health in adult life. Compelling

evidence exists that healthier lifestyles, which include better diets and increased physical activity, reduce people's risk for CVD.<sup>22</sup> Thus, preventative programming should include modifiable lifestyle factors, including diet, physical activity, and obesity interventions in an effort to reduce the risk of atherosclerotic disease in both the individual child and the population at large.<sup>20, 23</sup>

At a recent National Heart, Lung and Blood Institute (NHLBI) meeting of CVD leaders, discussions regarding future CVD programming included creating healthy cardiovascular cultures, placing more emphasis on public health strategies, focusing more on behavior, and enhancing prevention aimed at the pediatric age group. One expert stated that for a risk factor such as obesity, treatment is difficult for the average physician and that prevention, beginning with young children, was the more feasible approach.<sup>23</sup> School health programs initiated in preschool and extending through high school have the potential to improve the cardiovascular health of the greatest number of US children and youth.<sup>24</sup>

### ***Psychosocial Risks***

In addition to medical comorbidity, overweight children and adolescents are at increased risk for social and emotional difficulties. Few problems in childhood may have as significant an impact on childhood emotional development as obesity. Studies of children as young as six years of age suggest that overweight individuals are most likely to be described as lazy, lying, cheating, sloppy, dirty, ugly and stupid.<sup>25, 26</sup> Childhood obesity is associated with lowered self-esteem, diminished body image, decreased quality of life, and increased symptoms of depression.

Children who are overweight have increased peer difficulties, including being teased and marginalized by peers more often than normal weight children.<sup>27</sup>

#### **D. Adiposity Rebound**

The preschool years have been identified as a critical time to introduce and encourage healthful habits. Not only is it a time when eating and physical activity habits are established, it is also a time period immediately preceding the upswing in body mass index (BMI) known as adiposity rebound.<sup>17</sup> Adiposity rebound occurs typically at 4 to 6 years of age and early adiposity rebound predicts an increased BMI in adulthood.<sup>28</sup> An early adiposity rebound is associated with advanced skeletal maturity and parental obesity and there is evidence to suggest an association with a sedentary lifestyle.<sup>29</sup>

The preschool years provide an opportunity to establish healthful eating and physical activity behaviors that can lessen the growth of obesity and potentially delay the adiposity rebound. Obesity prevention for preschoolers should provide early experiences with foods and flavors, help develop healthy food preferences, encourage appropriate parental feeding practices, monitor rate of weight increases to prevent early adiposity rebound, and provide child and parent nutrition education.<sup>30, 31</sup> In addition, preschoolers should also be exposed to age- and developmentally-appropriate physical activities that explore new movements and enhance motor skill development.

## **II. Nutrition**

Childhood is a developmental period when lifelong eating habits are molded and established. According to Birch et al., early interface with children will help establish healthful habits that carry into adulthood.<sup>32</sup> Unfortunately, children are not eating adequately or being offered appropriate dietary variety. Limited family resources can impact the purchasing power and ability to attain a variety of healthful foods.

Children's diets mirror the same nutritional deficits as their parents' diets- high in total fat, saturated fat, sodium, and sugar, and low in fiber content. In a USDA government report, only 36 percent of 2- to 3-year olds were classified as having a 'good' diet; and this percentage decreased with increasing age. Much of the decline in diet quality for children occurred between the age groups two to three and four to six. Between these two age groups, the percentage of children having a 'good' diet fell from 36 to 17 percent. Thus, as children grew older, the quality of their diet declined.<sup>33</sup> Moreover, 2004 data from the Colorado Child Health Survey, indicate that only 35.9 percent of children aged 1 to 14 eat fruit two or more times per day and only 5.4 percent eat vegetables three or more times per day.<sup>34</sup>

Introduction of a variety of foods to children at an early age is essential because they develop food preferences, establish dietary habits, and acquire food preferences during the first six years of life.<sup>35</sup> Preschoolers go through a normal developmental phase called neophobia, fear of new things (i.e. new foods). Food neophobia is what most parents refer to as "picky eating". Persistently and consistently offering a variety of new foods to preschoolers will help the majority of children overcome the natural tendency to reject new foods, thus creating more healthful eating habits<sup>36</sup>. Because exposure to new foods leads to intake which, in turn, leads to preference,

introducing young children to healthy new foods is important. It is suggested that a preference for energy dense foods may serve as a risk factor in the development of overweight if consumption of these foods leads to excessive fat and energy intake. Conversely, a preference for fruits and vegetables may serve as a protective factor for the development of overweight.<sup>37</sup>

Early developed habits are thought to be carried through to adulthood, which is why intervening at an early age is important. In addition, information regarding neophobia has not been communicated adequately to the lay public; thus, many parents are not aware of or do not know the best strategies to deal with this issue. Numerous studies indicate the need for nutrition education resources aimed at encouraging parents to offer new foods to children, help children explore and learn about foods, and provide children with a variety of healthful foods to facilitate their development of healthful eating behaviors.<sup>38-40</sup> Additionally, research has found that low-income mothers with preschool-aged children consider their Head Start center, WIC, and pediatricians to be important sources of nutrition information.<sup>41</sup> Therefore, Head Start and other community settings, like WIC and pediatricians, are a crucial vehicle for both dissemination of information and opportunities for healthful experiences for children. Additionally, they can serve as important avenues to reach adults – teachers and parents – with health promotion programming.

### **III. Physical Activity**

Although the relationship between physical activity, obesity, and health in adults has been well documented, the impact of childhood activity on adult health has not.<sup>28</sup> As noted earlier, evidence does suggest that some chronic diseases – cardiovascular,

obesity, diabetes – begin to develop in childhood; and health behaviors developed in childhood may be precursors of adult health behaviors.

### **A. Preschoolers' Physical Activity Levels**

Declining levels of physical activity may be responsible for rising childhood obesity rates. Research shows that lower levels of physical activity and habitual exercise among children are associated with higher BMI, greater skinfold thickness, greater fat mass, and obese status. Similarly, lower levels of fitness have been associated with an increased likelihood of being overweight.<sup>37</sup> Studies involving preschool-aged children have demonstrated that physical activity is protective against accelerated weight gain and inversely associated with change in body fatness.<sup>17, 42</sup> Additionally, increased physical activity has been found to promote weight loss in obese preschool-aged children.<sup>43</sup>

While adults have been shown to over-estimate the level of physical activity of youth, most data support the conclusion that the majority of children tend to be physically inactive.<sup>44</sup> A study by Sallis et al. found that two-thirds of preschool children have inadequate levels of physical activity and children generally engage in less physical activity as they grow older.<sup>44</sup> Dowda et al. found that preschoolers were engaged in moderate to vigorous physical activity (MVPA) only 27 percent of the time they were observed by researchers, failing to meet current recommendation 1 hour of MVPA of participation in physical activity.<sup>45</sup>

Between 1981 and 1997 children's free playtime dropped by an estimated 25 percent, and this change appears to be driven by increases in the amount of time

children spend in structured activities.<sup>46</sup> Within children's unstructured time, sedentary activities such as watching television, using the computer, and playing videogames compete with active play. Rideout et al. found that preschoolers who watch 2 or more hours of television a day spend an average of 30 minutes less time each day playing outside compared to those who watch less than 2 hours a day.<sup>47</sup>

## **B. Factors Influencing Preschoolers' Physical Activity Levels**

Many factors may contribute to physical activity levels of preschoolers, such as gender, ethnicity, and their weight. Studies have shown that boys tend to be moderately more active than girls.<sup>26, 44, 48-50</sup> Boys tend to partake in games involving speed, strength, endurance, and aggression whereas girls' games are more likely to include turn-taking, orderly sequences, partial involvement, and solitary practice.<sup>48</sup> Further, ethnicity contributes to physical activity levels as Anglo-Americans are more active than Mexican-Americans and African Americans.<sup>51, 52</sup> Because ethnic differences in physical activity levels can be detected as early as four years of age, special attention to promote physical activity in ethnic groups may be warranted.<sup>52</sup>

Moreover, Trost examined levels of physical activity among overweight preschoolers and non-overweight preschoolers during the preschool day. He found that overweight boys participated in significantly less physical activity than non-overweight boys. The report suggests that a considerable percentage of overweight preschool children may be at-risk for further gains in adiposity by virtue of their low levels of physical activity during the preschool day.<sup>17</sup>

Family environments also play a large role in determining children's physical activity levels, including parental obesity, parental involvement, and parental physical activity habits. A significant correlation between the child's BMI with the mother's BMI has been observed. Additionally, the literature suggests that more active children are more likely to have a father with a lower BMI than less active children.<sup>52, 53</sup> The family can be strong target for interventions to increase children's physical activity and to prevent and improve management of childhood obesity.<sup>54</sup> Parental physical activity levels appear to play a critical role in establishing the activity levels of their children. Children whose parents are physically active have been reported to be nearly six times as likely to be active than children whose parents are both inactive.<sup>55</sup> Moore et al. found that children of active mothers were two times as likely to be active as children of inactive mothers. Further, when both parents were active, children were almost six (5.8) times as likely to be active.<sup>56</sup> Other studies have reported that children whose parents were active were more likely to be active themselves, suggesting that families with young children tend to carry out activities as a family unit.<sup>43, 57</sup>

Parental physical activity through role modeling could have a substantial influence on a child's activity.<sup>43</sup> Parents of overweight children may exhibit activity-related behaviors and/or parenting practices that consciously or unconsciously discourage their children from participating in physical activity.<sup>17</sup> Children who believe that their parents and peers want them to exercise tend to be more active. Also, direct parental encouragement to be active has been associated with higher levels of activity in preschoolers.<sup>44</sup>

While it is believed that parental influence may be the most modifiable factor in increasing children's physical activity in preschoolers, the childcare setting is also a strong predictor of activity levels of young children. The time spent in childcare can be extensive when both parents are working. Approximately, 60 percent of mothers with preschool-aged children are employed, with 70 percent working full time.<sup>58</sup> It is estimated that 40 percent of children aged 3 to 4 years of age whose mothers are employed spend more than 35 hours per week in nonparental care.<sup>53</sup> Thus, implementation of activity interventions where children spend a significant amount of their time makes sense.

### **C. Physical Activity in the Childcare Setting**

Simply providing children with equipment and free time in the preschool environment may not be enough to increase physical activity in children. Examining the effects of environment on physical activity behavior has been identified by the Centers for Disease Control and Prevention (CDC) as an important research topic for understanding 2- to 5-year old children's physical activity patterns.<sup>28</sup> Finn et al., in a study of 214 children, found that more than 50 percent of daily activity occurred in the childcare setting.<sup>53</sup> Pate et al. found that the characteristics of a preschool had a much greater influence on physical activity than the child's personal demographic characteristics.<sup>59</sup>

Dowda et al. conducted a study to determine if physical activity levels of preschool children vary with differences in policies, practices, and overall quality of preschools.<sup>45</sup> The study found significant physical activity differences between preschools that differed on certain policies and practices. In particular, offering

frequent field trips and employing college-educated teachers was associated with significantly higher levels of moderate to vigorous physical activity (MVPA). In addition, greater school quality as measured by the Early Childhood Environment Rating Scale-Revised Edition (ECERS-R) was associated with lower levels of sedentary behavior. Specifically, environments that included better furnishings and adequate space, quality of activities offered, and program structure and interactions among the children and between the children and teachers. This may suggest that children may be more active in preschools that have more resources.<sup>45</sup> It should be noted that similar levels of physical activity were found between private, church-based, and Head Start preschools.

These findings, in conjunction with the findings of Pate et al. and Finn et al., suggest that school policies and practices directed toward providing preschool-aged children with physical activity have greater potential to influence activity levels of preschoolers.<sup>17, 53, 59</sup> The quality and quantity of physical activity in the child care settings can vary depending on indoor space, gross motor play equipment, outdoor play area, group size, and the education and training of child care staff. To insure adequate accumulation of MVPA by young children, it is recommended that preschools should consider adding structured physical activity to their programs.<sup>45</sup>

#### **D. Fundamental Movement Skills and Concepts**

##### ***Movement Skills***

In addition to providing supportive environments for physical activity, structured physical activity programs that go beyond free play and outdoor play time are necessary. Teachers and providers require training on how to encourage activity so

children can increase activity and fitness levels as well as develop appropriate motor skills.<sup>52</sup> Garcia et al. suggest that successful preschool physical activity programs are based on two key components: 1) children are allowed to have fun with the activity and 2) fundamental motor skills are taught.<sup>60</sup>

Fundamental movement skills, commonly referred to as basic or gross motor skills, are the foundational skills (i.e. walking, running, jumping, and throwing) that provide the building blocks for specific movements such as those found in advanced and specific movement activities like sport, games, and dance.<sup>61, 62</sup> Fundamental movement behaviors can be classified into three general motor groups: locomotor, nonlocomotor, and manipulative. Locomotor skills are movements that transport and individual from one place to another. Examples include rolling, walking, running, jumping, hopping, galloping, and skipping. Nonlocomotor skills are those activities where there is minimal or no movement of the body's base of support (i.e. the feet). These skills usually require the individual to maintain balance over the base while moving other parts of the body such as the trunk or arms. Examples include bending, swaying, and twisting. Manipulative skills involve control of objects primarily with the hands or feet. Examples of these skills include throwing, catching, dribbling, kicking, and striking.<sup>62</sup>

### ***Movement Concepts***

In addition to practicing skills, children should learn movement concepts. Movement concepts are the knowledge component of a movement learning curriculum. Learning the concepts helps to modify or enrich the range of skills and the effectiveness of children's use of skills.<sup>63</sup> Movement concepts can be categorized

into space awareness, effort, and relationships. Space awareness movement concepts include space location, directions, levels, and pathways. Effort movement concepts refer to how the body moves in space which includes components of time, force and flow. Relationship concepts refer to ways the individual moves in relation to others – in pairs, as a group, or by themselves.<sup>63-65</sup> Graham et al. summarizes how movement concepts compliment motor skills:

The distinction between movement concepts and skill themes can be clarified by comparison to grammar. Skill themes are always verbs – they are movements that can be performed. Movement concepts are always modifiers – they describe how a skill is to be performed. This distinction also clarifies how movement concepts are employed to embellish, enhance, or expand the quality of a movement. A verb by itself – strike, travel, roll – is typically less interesting than one that is modified by an adverb – strike hard, travel jerkily, roll smoothly. Skills can stand by themselves. You can roll or gallop or jump, but you can't slow or high or under. Concepts modify skills.<sup>63, 66</sup>

Once developed, basic motor skills and concepts comprise movement patterns.

### ***Movement Patterns***

Movement patterns involve a series of movements organized in a particular time-space sequence and are the basic functional structure of fundamental motor skills. Proficiency in movement pattern execution ranges from immature or minimal (2 to 3-year olds) to mature or sport skills (6-year olds). With practice, by the end of the sixth year most children acquire at least some features of the mature movement pattern. Mature movement pattern performance is skill- rather than age-related. Further development of mature movement patterns occurs from ages 7-12 and appears during the sport skill phase of movement behavior.<sup>61</sup> Table 2-2, illustrates the continuum of motor development.

Table 2-2: *The Motor Developmental Continuum*<sup>61</sup>

<b>Phase</b>	<b>Approximate Age</b>	<b>Stage</b>
Reflexive/Spontaneous	Conception	Prenatal
↓ Rudimentary ↓	Birth	
		6 months – 2 years
Fundamental Movement	2 years	Early Childhood
	6	
Sport Skill	6 -12	Later Childhood
Growth and Refinement	12 -18	Adolescence
	18 – 30	
Peak Performance	18 – 30	Adulthood
Regression	30 - 70 & older	Older Adulthood

While children develop according to their own unique timetables, some general milestones normally take place by certain ages. By the time they are 5, preschoolers are executing most, if not all, of the basic locomotor and nonlocomotor skills, as well as a number of manipulative skills. While basic motor skills like walking, running, hopping, and galloping are mastered by age 5, sliding and skipping remain challenging for preschoolers. Many 4- and 5- year olds first skip on one side only, and many do not master skipping on both sides until after the age of 5. Nonlocomotor skills, such as balancing, improve tremendously during the preschool years. Three year olds can balance briefly on their preferred foot and by the time they are 5 years old, most can hop on either foot for 15 feet, and stand on one foot, hands on hip, for 10 seconds or longer. Manipulative skills also develop

significantly. Preschool children begin to throw with greater accuracy, for longer distances; they experience success with catching a bounced ball (3 year olds) and catch a medium-sized thrown ball (5 year olds).<sup>65</sup> Table 2-3, illustrates milestones in motor development for 3-, 4-, and 5-year olds.

Table 2-3: *Milestones in Motor Development*<sup>65</sup>

<b>3 year olds</b>
Change speed, direction, or style of movement at signal
Walk a straight line and low balance beam
Run on tiptoes
Throw ball without losing balance and can throw underhand
Gallop
Hop briefly
Use hands and feet simultaneously (i.e. stamping feet while clapping)
Use alternate feet to ascend stairs
Catch a large or bounced ball with both arms extended
Jump to floor from approximately 12 inches
<b>4 year olds</b>
Start, stop, turn, and move easily around obstacles and others (well oriented in space)
Hop on non-dominant foot
Cross feet over midline of body
Descend stairs with alternate feet
Jump over objects 5 to 6 inches high
Leap over objects 10 inches high
Bounce and catch a ball
May skip on one side only
<b>5 year olds</b>
Slide
Skip using alternate feet
Catch a thrown ball, though not always successfully
Balance on either foot
Shift body weight to throw ('steps out' with foot opposite throwing hand)
Execute simple dance steps
Kick a rolling ball

Children do not develop motor skills naturally; instead children need instruction, encouragement and repetitive practice to achieve mature motor skills.<sup>60</sup> During the preschool years, children should be encouraged to practice movement skills in a variety of activities and settings. Many children never develop certain mature patterns of motor skills and as a result they perform poorly as they grow older. These early failures can damage the child's self-esteem as well as lead to avoidance of movement. Children with low motor skills know that they can't move efficiently, they feel awkward, uncoordinated, and inhibited, thus leading to decreased movement.<sup>60</sup> When designing a physical activity intervention for preschool-aged children, emphasis on motor skill development is essential so that children are comfortable and improve their self-efficacy toward physical activity.

### **E. Relationships between Physical Activity, Motor Skills, and Body Composition**

It is widely believed that fundamental movement skills and habitual physical activity are related in childhood and adolescents. In addition to determining the impact of environmental factors on preschool physical activity policies, CDC has highlighted the relationship between habitual physical activity and motor skills as another priority area of research for physical activity and preschoolers.<sup>28</sup>

Few studies have examined the relationship between habitual physical activity and fundamental motor skills. Okely et al. found a significant relationship between fundamental movement skills and self-reported participation in organized physical activity in adolescents. However, only a small proportion (3 percent) of participation can be explained by fundamental movement scores.<sup>67</sup> Saakslanti and Numminen et

al. found physical activity in 3- to 4-year olds to be weakly related to fundamental motor skills and was gender dependant .<sup>68</sup> Fisher and colleagues examined this same relationship in 394 preschool-aged children using accelerometer and the Movement Assessment Battery (15 fundamental motor skills). They found that fundamental movement skills were significantly associated with habitual physical activity, but the association between the two variables was weak, thus questioning the relationship.<sup>69</sup> Fisher et al. also found marked differences between time spent in MVPA and motor skills at the extremes of the distribution, suggesting that the associations in the upper and lower quartiles may be more important. To illustrate, children with the most limited engagement in MVPA had the poorest performance in motor skills assessment, and it is possible that limited engagement in MVPA might hinder motor development or that limited motor development might restrict participation in MVPA. Further exploration in the relationship between habitual physical activity and fundamental motor skills through longitudinal and intervention studies might provide greater ability to detect associations between these variables.<sup>69</sup>

In addition to examining relationships between fundamental movement skills and habitual physical activity, studies exploring the relationships between body composition and physical fitness and/or movement skills have been conducted. Several studies have reported strong correlations between body composition and health related fitness components (cardiorespiratory fitness and muscular endurance).<sup>67</sup> Ellery et al. found no relationship between skinfold thickness and gross motor skill performance among 220 preschool children.<sup>67</sup> Conversely, Malina et al. examined the association between the sum of five skinfolds and five motor

performance items in over 9,000 girls ages 6-18 years and found that as adiposity increased, balance, speed, power, and strength decreased.<sup>70</sup> McKenzie et al. investigated the relationship of three movement skills (balance, catch, and jump) and the mean of two skin-folds among 400 children ages 4-6 years. Skinfolds were inversely related to balance in boys and girls, and the jump and index of the 3 skills in boys.<sup>51</sup> In a study by Okely et al. with 4,363 children and adolescents, non-overweight boys and girls were two to three times more likely to possess more advanced locomotor skills than overweight boys and girls.<sup>71</sup>

Due to the small number, different sample populations, and contradictory nature of studies examining relationships between physical activity, physical fitness, motor skills, and body composition, additional research in these areas is warranted.

Further, because measurement tools to assess/report physical activity in preschool-aged children are lacking, determining relationships between physical activity and other variables is suspect.

#### **IV. Assessing Physical Activity, Fitness and Motor Skills in Preschoolers**

##### **A. Physical Activity Assessment**

Accurate quantification of physical activity in early childhood is recognized as being fundamentally important for a number of reasons including; measuring physical activity levels and changes to these levels; establishing dose-response relationships between physical activity and health outcomes; allowing effectiveness of interventions to be ascertained; and to identify children at increased health risk because of their physical inactivity.<sup>72</sup> Because physical activity in preschoolers usually occurs during free play rather than during structured activities, and this play

consists of short intermittent bouts of activity with frequent rest periods, acceptable valid and reliable measurement and assessment tools for this age group are limited. The most feasible measure for young children are direct observation, proxy reports by parents and teachers, and motion sensors including accelerometers and pedometers.<sup>48</sup>

### ***Direct Observation***

Direct observation has been considered the 'gold standard' and is used to validate other measures because of its ability to categorize the intensity of physical activities and discriminate between levels of energy expenditures in young children.<sup>48, 73</sup>

Typically, this method involves study personnel who observe a specific child, either in-person or on a videotape, for a certain length of time or series of times. The correlation between two direct observations of the same child, separated by periods of 1 day to 1 month, range from 0.54 to 0.81. The validity of direct observation, as determined by correlation with a motion sensor, is high, with correlation coefficient  $(r) = 0.90$ .<sup>28</sup> While a valid and reliable measure, direct observation can be impractical for epidemiological research as it is time consuming, expensive and is reliant on observer precision and presence which is often unfeasible.<sup>72</sup>

### ***Self- or proxy-report***

Self- or proxy-report instruments are the most commonly employed and frequently validated methods for adults and children to measure physical activity. With self report method, participants are asked to recall information about physical activity during a period of time in the recent past, or alternatively, they may be asked about "usual" or "habitual" activity behavior. It is well known that young children are unable

to self report their physical activity accurately.<sup>74, 75</sup> Thus, to obtain survey data on physical activity in preschoolers, researchers must rely on parents, teachers, and other adult caretakers.

Self or proxy-report methods are relatively inexpensive, quick to administer, and can be obtained by interview, questionnaire, or log. Major disadvantages of self report methods include the limitation associated with accuracy of recall and individual interpretation of questions. Most self-report methods are designed to measure structured physical activity in defined periods, making them less appropriate for measuring unplanned or unstructured physical activity (i.e. play time), which is a frequent source of physical activity for preschool-aged children.<sup>28</sup>

While some question the validity of surrogate reports by parents and other adult caregivers, several studies have determined adult caregivers' reports to be valid measures of preschoolers' physical activity levels.<sup>75</sup> Chen et al. validated a questionnaire completed by nursery teachers' with accelerometers to assess children's activity levels over 3 days (n=21).<sup>76</sup> Harro validated a physical activity questionnaire against heart rate monitors and motion accelerometers with 62 4- to 8-year olds. Both objective measures supported the validity of the questionnaire, and the correlation between the questionnaire and the two objective measures were significant.<sup>77</sup> More recently, Burdette et al. found significant correlation of parental-report of outdoor playtime and direct measure of physical activity by accelerometers in 250 preschool-aged children.<sup>74</sup> While there has been some success with proxy-reports, the consensus is that much more research is needed in this area.

### **Accelerometers**

Accelerometry is the most commonly used objective approach to monitoring free-living physical activity in young children. Uniaxial accelerometers are small and light and are often used in a controlled classroom environment. They can detect volume of movement and can be used to infer time in bouts of activity of various intensities.<sup>78</sup> Accelerometry's disadvantages include under-detecting certain non-weight bearing activities (i.e. swinging, hanging, spinning) as well as their high cost and need for sophisticated software.<sup>75, 78</sup>

While accelerometers and pedometers have been widely used in school-aged children to understand total daily physical activity, limited work has assessed the efficacy of these instruments in younger, preschool-aged children.<sup>72</sup> Pate et al. conducted a study with 30 three- to five- year olds to validate accelerometers in this age group. They found that the accelerometer was highly correlated with VO<sub>2</sub> in young children ( $r=0.82$ ).<sup>75</sup>

### **Pedometers**

A pedometer has been noted in many studies as being an objective measure of physical activity in preschool-aged children. Trost concluded that pedometers provide valid assessments of the total volume of physical activity performed by children. Pedometers are especially useful in studies in which the goal is to document relative changes in physical activity or to rank order groups of children on physical activity participation.<sup>79</sup> Because of the pedometer's cost-effectiveness, this method has great potential for measuring habitual physical activity in large samples.<sup>28, 48, 79</sup>

Pedometers are unable to measure intensity of activity or to accurately record activities such as cycling, swimming, and skateboarding, all common activities of young children. These may affect the validity of the information gathered with young children given the episodic and variable nature of their play.<sup>48</sup>

Easton and colleagues reported a correlation of 0.92 between steps recorded by a pedometer and scaled oxygen consumption during treadmill walking/running and unstructured play activities in 8-10 year olds.<sup>80</sup> It is only recently that pedometers have been tested on young children. Louie and Chan ( $r=0.59$ ), McKee et al. ( $r=0.95$ ), and Oliver et al. ( $r=0.64$ ) have also demonstrated validity of pedometers with preschoolers.<sup>72</sup> In these studies direct observation was used to validate pedometers during preschool free-play sessions. While Oliver et al. found valid correlations with direct observation, the study also examined the accuracy and reliability of pedometer readings compared with observed steps. They used 95 percent prediction intervals and concluded that limits of agreement and prediction intervals for directly observed step counts were wide for pedometers, thus calling into question their acceptability for use with preschoolers.<sup>72</sup> Hands et al. compared direct observation to both accelerometry and pedometry in 24 5- and 6-year olds and found that a pedometer ( $r = 0.81$ ) was more able to accurately predict all levels of physical activity compared to an accelerometer ( $r = 0.59$ ).<sup>48</sup>

The use of pedometers is becoming more widely used in research and practice. To effectively interpret and use pedometer assessed ambulatory activity, normative values or benchmarks for interpreting change and for comparison purposes is necessary. A systematic review of 32 empirical studies by Tudor-Locke suggests

that we can expect 12,000 -16,000 steps/day for 8-10 year old children (lower for girls than boys); 7,000 – 13,000 steps/day for relatively healthy, younger adults (lower for women than men); 6,000 – 8,500 steps/day for healthy older adults, and 3,500 – 5,500 steps/day for individuals living with disabilities and chronic illnesses as well as healthy, North American women in ethnic minorities.<sup>81</sup> Because studies using pedometers with preschoolers have only occurred during the last few years, with small samples, and during a small time frame, normative data on the number of steps per day that preschoolers has only been reported in one study. Cardon and De Bourdeaudhuij found that preschoolers' average daily step count to be 9,980 ( $\pm 2,605$ ). Further, daily steps counts were strongly correlated ( $r=.73$ ) to accelerometer's MVPA minutes.<sup>82</sup>

## **B. Motor Skill Assessment**

As researchers aim to define the relationship between habitual physical activity and motor skills in preschoolers, they are challenged by the lack of consensus on the definition of motor skill (fundamental movement skill). In studies conducted with young children to examine relationships between motor skills and other factors, valid and reliable motor skill scales have been used but are not as inclusive as some standardized tests.<sup>68, 69, 83, 84</sup> Two tests, Bruininks-Oseretsky Test and the Peabody Developmental Motor Scales, were examined for use in this study.<sup>83, 85</sup>

### ***Bruininks-Oseretsky Test***

Several studies examining the motor proficiency of preschool-aged children have used the Bruininks-Oseretsky Test. This test is comprised of eight subsets and has both a gross- and fine-motor skill component. The gross motor subsets include: (1)

Running, Speed and Agility, (2) Balance, (3) Bilateral Coordination, and (4) Strength.<sup>83</sup> While this test has been used in research studies including young children (4 to 6 year olds), its ability to be used to study preschoolers as a whole, is questionable because it was developed for 4.5 to 14 year olds. Thus, its ability to reach younger preschoolers, 3 and 4 year olds, is uncertain.

### ***Peabody Developmental Motor Scales***

The Peabody Developmental Motor Scales (PDMS) is a norm- and criterion-referenced motor skill test that consists of a Gross Motor Scale and Fine Motor Scale. The assessment is composed of six subtests that measure interrelated motor abilities that develop early in life. It is designed to assess the motor skills of children from birth through 5 years of age. Reliability and validity have been determined empirically. The normative sample consisted of 2,003 persons residing in 46 states.<sup>85</sup> Reliability coefficients were computed for subgroups of the normative sample (e.g., individuals with motor disabilities, African Americans, Hispanic Americans, females, and males) as well as for the entire normative sample.

The norms on the PDMS for each of its two scales include percentile ranks, age equivalent scores, and normalized standard scores, including z scores and developmental motor quotients. The PDMS items are scored on the following criterion: 0 when the child's performance does not meet the stated criteria, 1 when the performance partially meets criteria and 2 when the child's performance meets all of the stated criteria.<sup>86</sup>

Of the six subset of PDMS, three – stationary, locomotor, and object manipulation – are pertinent to assessing the gross motor skills of preschool-aged children. The stationary subtest measures a child's ability to sustain control of his or her body within its center of gravity and retain equilibrium. The locomotion subtest measures a child's ability to move from one place to another. The actions measured include crawling, walking, running, hopping, and jumping forward. The Object Manipulation subtest measures a child's ability to manipulate balls. Examples of the actions measured include catching, throwing, and kicking.<sup>85</sup>

### **C. Physical Fitness Assessment**

Little research on assessing physical fitness in preschool-aged children has been cited in the literature, despite the growing interest of physical activity and motor ability in this population. The components of physical fitness – cardiorespiratory endurance, explosive strength, running speed, agility, trunk strength, and flexibility – are often referred to as motor ability and movement skills of preschoolers in the literature, thus making it difficult to differentiate. Only one study examining the reliability of a test battery to measure physical fitness (referred to as motor ability in the article) was found. Oja studied 932 Estonian children aged 4- to 5-year old children in sit-n-reach (flexibility); standing long jump (explosive strength); shuttle run 4 X 10 meter (running speed, agility); sand bag throw for distance with dominant hand (explosive strength, coordination); situps for 30 seconds (trunk strength) and shuttle run, 3 minutes (cardiorespiratory endurance). All tests but the sand bag throw had acceptable reliability ( $r > 0.75$ ) and were deemed to be acceptable measures in four to five year old children.<sup>87</sup> More research is obviously needed in this area.

## **V. Physical Activity Programming for Preschoolers**

### **A. Physical Activity Recommendations for Preschoolers**

The Healthy People 2010 Indicators provide guidelines on obesity and physical activity for school-aged children and adults but not young children (2- to 5-year olds).<sup>88</sup> However, physical activity guidelines for preschoolers have been established by the National Association of Sport and Physical Education (NASPE) to guide parents, caregivers and teachers of young children about physical activity capabilities of infants, toddlers, and preschoolers. The specific guidelines include:

1. Preschoolers should accumulate at least 60 minutes daily of structured physical activity.
2. Preschoolers should engage in at least 60 minutes and up to several hours of daily, unstructured physical activity and should not be sedentary for more than 60 minutes at a time except when sleeping.
3. Preschoolers should develop competence in movement skills that are building blocks for more complex movement tasks.
4. Preschoolers should have indoor and outdoor areas that meet or exceed recommended safety standards for performing large muscle activities.
5. Individuals responsible for the well-being of preschoolers should be aware of the importance of physical activity and facilitate the child's movement skills.

These guidelines recognize that preschoolers are naturally active, gravitate toward physical activities that are enjoyable, and require time to learn and refine basic motor skills. The duration, frequency, and intensity of movement and physical activity will depend on a child's age, developmental status, ability level, personal interest, prior physical activity experience, and normal tendency to alternate short bursts of activity

with intervals of rest or recovery. Teachers and caregivers should allow preschoolers to partake daily in both structured physical activity, where activities are planned, directed, and designed for the child's developmental level; and unstructured physical activity, where the activity is child-initiated and allows for the child to explore his or her environment.<sup>62</sup>

Structured physical activity experiences for 3- to 4-year old children should be aimed at introducing a variety of different movement skills rather than having the child achieve a high level of movement competence in any one skill. Initially, children should be directed to explore a variety of movement skills individually, then with a partner, and finally in a small group. Activities that use variety of locomotor, nonlocomotor, and manipulative skills and engage the child's imagination are desirable.<sup>62</sup>

Unstructured physical activity experiences should encourage the child to explore large outdoor toys and equipment, including wheeled vehicles and preschool playground equipment. Opportunities for climbing, balancing, swinging, hanging and sliding allow for children to explore what their bodies can do, while potentially sparking an interest and liking to physical activity.<sup>62</sup>

To help meet the daily physical activity recommendations for preschoolers, experts recommend incorporating planned physical activity into the daily preschool schedule. Most preschool children have short attention spans and are easily distracted; therefore, activity sessions should be short and emphasize playfulness, experimentation, and exploration of a wide variety of movement experiences.<sup>89</sup>

Structured activity sessions should be about fifteen to twenty minutes, and should emphasize a wide variety of different movements.<sup>45, 58, 89</sup> Instructing younger children using a show-and-tell format with physical demonstration may be more effective than verbal instruction.<sup>89</sup>

## **B. Elements of Developmentally Appropriate Preschool Activity Programs**

While many are calling for more structured physical activity in the childcare setting, many providers and teachers have never received training on physical activity and are unaware of developmentally appropriate practices. In 2000, a position statement of NASPE on appropriate practices in movement programs for preschoolers was developed by the Council on Physical Education for Children (COPEC). The position statement outlines five key premises that should be included for quality movement programs which are developmentally and instructionally appropriate.

1. *Teachers of young children are guides or facilitators.* Young children learn through involvement, observation, and modeling, which requires teachers to facilitate children's active involvement in learning.<sup>90</sup> Gallhue summarizes, "Too often children are turned loose on various forms of equipment and expected magically to develop efficient forms of movement behavior on their own. Only through wise guidance, thoughtful interaction, and careful planning can we assure the proper development of children's movement abilities."<sup>91</sup>
2. *Children should engage in movement programs designed for their developmental levels.* Young children need a variety of experiences that will lead to mature fundamental motor skills. A developmentally appropriate

movement program accommodates a variety of individual characteristics such as developmental status, previous movement experiences, fitness and skill levels, body size, and age. Instructionally appropriate movement programs incorporate the best known practices, derived from both research and experiences teaching children, into a program that maximizes opportunities for learning and success for all children.<sup>90</sup>

3. *Young children learn through interaction with their environment.* Children learn by doing and through active involvement with people and objects.<sup>90</sup> Opportunities to practice enable children to develop a functional understanding of basic movement concepts.<sup>92</sup> To learn how to climb, throw a ball, jump or do any other physical skill, children need a variety of practice opportunities over time and within many different contexts.<sup>63</sup>
  
4. *Young children learn and develop in an integrated fashion.* Motor, cognitive, emotional, and social development are interrelated.<sup>90</sup> In addition to acquiring and refining motor skills, children's cognitive abilities and social skills are rapidly improving during the preschool years. According to Piaget, movement is an essential element to the formation of intellect.<sup>65</sup> Cognitive growth is vast during the preschool years. Speech becomes more intelligible, the attention span increases, curiosity grows, and spatial concepts begin to be understood.<sup>65</sup> Movement activities provide opportunities for young children to develop critical thinking skills.<sup>92</sup> Preschoolers' affective development includes growth in self-awareness, self confidence, and self-control. Preschoolers show increasing interest and concern for one another, learning to take turns,

share, and collaborate.<sup>65</sup> Frostig summarizes how movement enhances social development in young children: "Movement education can help a child to adjust socially and emotionally because it can provide him with successful experiences and permit interrelationships with other children in groups and with a partner. Movement education requires that a child be aware of others in [activities] in which he shares space...he has to take turns and to cooperate. He thus develops social awareness and achieves satisfaction through peer relationships and group play."<sup>93, 94</sup>

5. *Planned movement experiences enhance play experiences.* A combination of play along with planned movement experiences, specifically designed to help children develop fundamental motor skills, is beneficial in assisting young children in their development.<sup>90</sup> Movement based learning should include a combination of imitative and movement exploration. The imitative approach recognizes the importance of fostering the young child's imagination while enhancing their movement vocabulary. Imitative exploration can include mimicking animals, emotions, and novel ways of movement. Through movement exploration teachers can challenge children to explore a variety of movement possibilities by building on past experiences and utilizing critical thinking. With movement exploration the desire to have children physically respond in a variety of creative ways and situations is greater than the need to have children obtain advanced skills for movement efficiency.<sup>64</sup>

In addition to the five premises of quality, COPEC outlines appropriate and inappropriate practices for facilitating maximum participation, allowing for repetition and variation, encouraging individual and free expression, facilitating gender equity, developing movement skills and concepts, and several other practices.<sup>90</sup>

## **VI. Head Start**

### **A. Background**

Head Start, a federal preschool program serves children aged birth to five, includes a varied mix of programs – education, health, nutrition, social services, and parental involvement – that presents a unique opportunity to combat childhood obesity.<sup>58</sup>

Head Start was created in 1965 to help break the cycle of poverty by providing preschool children of low-income families with a comprehensive program to meet their emotional, social, health, nutritional, and psychological needs.<sup>95</sup>

Nationally, Head Start reached 906,993 children in 19,800 centers (49,235 classrooms) in 2005. While Head Start serves low-income children up through the age of 5, the majority of children are ages 3 (34 percent) and 4 (52 percent).

Additionally, Head Start reaches a racial and ethnically diverse population: 31.1 percent Black/African American; 35.0 percent white; and 32.9 percent Hispanic.<sup>96</sup>

Colorado has 297,505 children under the age of 5, representing 6.9 percent of the states total population.<sup>97</sup> Colorado's 600 Head Start classrooms reach 9,872 children annually. Approximately 60 percent of those enrolled in Head Start have identified themselves as Hispanic or Latino and 35 percent speak Spanish as their dominant language.<sup>98</sup>

## **B. Nutrition and Physical Activity within Head Start**

Head Start is an important source of nutrition for low-income children. Its federal performance standards require its meals and snacks to provide at least one-third of the daily nutritional needs of children in a half-day program and one-half to two-thirds of the nutritional needs of children in a full-day program. Further, Head Start federal guidelines require that settings provide opportunities for outdoor and indoor active play, adequate indoor and outdoor space, equipment for active play, and opportunities to develop gross and fine motor skills. The regulation, however, does not specify the amount, frequency, and type of physical activity.<sup>58</sup>

To meet the health needs of enrollees, Head Start places an emphasis on continuous primary health care. Heights and weights are monitored and parents receive guidance on physical activity and nutrition. Child Health Reports, obtained through a health screening within the first 45 days of enrollment, include calculated BMI information; however, it is unclear at this time as to how this information is being used at the individual, family, center, state, or national levels.<sup>58</sup>

Between Head Start's nutrition and physical activity standards, as well as their Child Health Reports, the program has great potential for obesity-prevention efforts. The program has national reach and could significantly improve healthful eating and physical activity patterns of young children. In addition, because it serves low-income minority children, those at greatest risk of overweight, it can serve as a vehicle to impact this difficult to reach audience. Interventions and policy changes could focus on ensuring that meals and snacks adhere to the Dietary Guidelines, that physical activity is increased, and that parents are actively involved. Moreover,

BMI screening results could be provided to parents and health providers and could be used for surveillance on state and national levels.<sup>58</sup>

### **C. Head Start Child Outcomes Framework**

To fit obesity prevention programming into an already full schedule, it is imperative that programs and curricula intended for Head Start align with the Head Start Child Outcomes Framework. The Head Start Child Outcomes Framework is intended to guide Head Start programs in their ongoing assessment of the progress and accomplishments of children. The Framework is based on the Head Start Program Performance Standards, Head Start Program Performance Measures, and other documents on assessment of young children and early childhood program accountability. It is composed of:

- Eight general Domains: Language Development, Literacy, Mathematics, Science, Creative Arts, Social and Emotional Development, Approaches to Learning, and Physical Health and Development;
- Twenty-seven Domain Elements: Domain Elements under Physical Health and Development Domain include: Fine Motor Skills, Gross Motor Skills, and Health Status and Practices; and
- One hundred examples of more specific Indicators of children's skills, abilities, knowledge, and behaviors. Examples of Indicators include:
  - Shows increasing levels of proficiency, control and balance in walking, climbing, running, jumping, hopping, skipping, marching and galloping (Under the Gross Motor Skill Domain);

- Participates actively in games, outdoor play and other forms of exercise that enhance physical fitness (Under Physical Health and Development Domain).

The Domains, Elements, and Indicators are presented as a framework of building blocks that are important for school success.<sup>99</sup>

## **VII. Obesity Prevention Efforts and Programs for Preschoolers**

In 2004, the Centers for Disease Control contended, “To the best of our knowledge, an intervention focusing on nutrition and physical activity to prevent overweight in young children in childcare settings has not been widely used or evaluated.”<sup>100</sup>

Since then only one obesity prevention program for preschoolers, *Hip-Hop to Health Jr.*, fitting CDC’s criteria has been published in the literature. Three other programs are worth noting because of their published outcomes, influence on the current study, and potential for impacting obesity efforts in preschoolers: *MAGIC*, *Healthy Start*, and *Food Friends*®.

### **A. *Hip-Hop to Health Jr.***

The primary aim of *Hip-Hop to Health Jr.* was to alter the trajectory toward overweight/obesity among preschool African-American and Latino children in Chicago Head Starts. Secondary outcomes included changes in dietary intake (percent of caloric intake of fat, saturated fat, and fiber via single dietary recall by parents) and physical activity (frequency per week and intensity as reported by parents).<sup>101</sup> A randomized intervention was conducted initially in 12 predominately African American Head Start centers, reaching 416 children and 337 parents. The

intervention was duplicated two years later in 12 predominately Latino Head Start centers reaching 362 Latino children and 309 Latino parents.<sup>102</sup>

The *Hip-Hop to Health Jr.* intervention was 14 weeks and included 40 minute lessons, three times a week on healthy eating and physical activity. Each 40 minute lesson included: (1) a 20-minute lesson that introduced a healthy eating or exercise concept with an activity and (2) 20 minutes of physical activity. Parents in the intervention centers received weekly newsletters mirroring efforts conducted in the classroom. Newsletters also included a homework lesson for parents, which if completed and returned parents received a \$5 grocery coupon. Twice weekly Control sites received general health education lessons.<sup>18</sup>

When *Hip-Hop to Health Jr.* was conducted in predominantly black Head Start centers, it was effective in reducing subsequent increases in BMI in preschool children. At both 1 year and 2-year follow-up, intervention children had significantly smaller increases in BMI compared with control children.<sup>101</sup> In contrast, when the program was conducted in Latino centers, it was not effective at altering the trajectory of BMI.<sup>103</sup> This demonstrates the importance of culturally-specific interventions.

While *Hip-Hop to Health Jr.* demonstrates a promising approach to overweight prevention in low-income minority children, it is not without limits. First, subjective measures of preschooler's physical activity reported by parents have been questioned as a valid measure of habitual physical activity. However, as mentioned earlier, measurement of physical activity in this age group is a challenge and

acceptable valid and reliable measurement and assessment tools for this age group are limited. The second major limitation to this intervention is that lessons were conducted by a trained early childhood educator rather than the classroom teacher, limiting the generalizability, as the consistency and enthusiasm of these trained teachers may not be replicated by busy classroom teachers.<sup>101</sup>

## **B. MAGIC**

Researchers in Scotland recently conducted a cluster randomized control trial to assess whether a physical activity intervention reduces body mass index in preschool-aged children. Secondly, objective measures of physical activity and motor skills were evaluated using accelerometers and the movement assessment battery, respectively.<sup>104</sup>

Thirty-six preschools (545 children) participated in the *Movement and Activity Glasgow Intervention in Children (MAGIC)* which included 30 minute activity sessions, three times per week over a 24 week time period. Findings did not show that the intervention had a significant effect on physical activity, sedentary behavior, or BMI. However, children in the intervention group had significantly higher performance in movement skill tests than control children at six month follow-up.<sup>104</sup>

The authors note that the increase in movement skills might foster an increase in activity levels in the future by increasing confidence or ability, and may have direct effects on body fat content in the long term. This study suggests that interventions focusing on only one of the two primary behaviors that contribute to obesity -nutrition and physical activity - may not have an effect on BMI.

### **C. *Healthy Start***

The *Healthy Start* intervention aimed to reduce cardiovascular risk in preschool children by: (1) reducing the total fat in meals and snacks to less than 30% of calories and reduce the saturated fat to less than 10% of calories through a food service intervention and; (2) implementing a comprehensive preschool health education curriculum, focused primarily on nutrition, *Healthy Start*. *Healthy Start* is an 11 unit curriculum with a goal to increase children's health awareness and knowledge and give the children ample opportunity to practice positive health behaviors through stories and poems, games and creative play, crafts, demonstrations, discussions and investigative observations.<sup>105</sup>

Nine Head Start centers in upstate New York participated and were randomly assigned to one of three groups: (1) food service and nutrition education (*Healthy Start*); (2) food service only; and (3) control. Results showed a significant decrease in total serum cholesterol among preschool children in the two food service intervention groups compared to Controls. In addition to the significant difference in group means, children with elevated cholesterol at baseline were significantly more likely to have a cholesterol level in the normal range at follow-up if they attended a preschool in the food service modification group. The intervention did not have a significant effect on changes in height-to-weight ratio, which was used to assess children's growth. Further, provision of supplemental nutrition education, *Healthy Start*, did not result in additional cholesterol lowering above and beyond that achieved by the food service intervention alone.<sup>19</sup>

This study demonstrates the importance of environmental interventions and the importance of reaching preschoolers with CVD prevention programs. It also suggests that nutrition education programs aimed at building awareness and knowledge do not translate into behavior change. Lastly, nutrition education and food service modifications may play a role in obesity prevention, but diet alone may not alter body composition in young children.

#### **D. *Food Friends – Making New Foods Fun for Kids*®**

*Food Friends – Making New Foods Fun for Kids*® is social marketing campaign designed to promote the importance of trying new foods in an effort to increase food choice, and thus dietary variety, among at-risk preschool-aged children. This program has been successfully evaluated to ensure that changes in eating behavior are attained. *Food Friends*® focuses on the children and secondary influencers - teachers and parents.

#### ***Classroom Component***

The *Food Friends*® program is a 12-week intervention developed by Colorado State University. The length of the program is critical in that the 12-week timeframe was established from literature reviews and our own pilot project evaluation data, confirming that 8-12 experiences are necessary for a child to try and accept a new food. Classroom implementation includes: a 15-20 minute nutrition activity once per week, reading storybooks that support the “try new foods” theme once per week, and opportunities to try new foods twice each week.<sup>106, 107</sup>

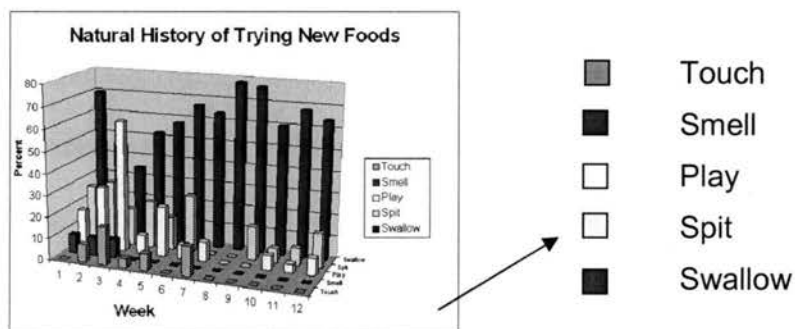
To bring the *Food Friends*® to life in a playful and exciting manner, various tactics have been constructed. Child-centered activities and supporting materials were developed around the seven characters and thirteen novel foods. The *Food Friends*® program uses familiar food characters, Ollie Orange, Tina Tortilla, Marty Milk, Howie Hamburger, and Corrine Carrot to introduce their 'new friends' Gertie Gouda and Rudy D. Radish to the class. These characters are seen throughout the program as puppets and on jigsaw puzzles, memory card game, posters, and placemats.<sup>106, 107</sup>

Data from the pilot food preference panel assessments showed that children exposed to the program significantly decreased the number of food refusals to novel foods compared to children in a control group. Zero percent of the children in experimental classrooms refused to taste the daikon radish at post intervention for the tasting panel assessment compared to 14 percent of the control group.<sup>108</sup> This outcome is indicative of an increase in their willingness to try new foods, the first stage towards food acceptance.

Further confirmation of the efficacy of the *Food Friends*® program is demonstrated by data related to behavioral antecedents of children adopting food seeking or "sampling" behaviors. In the pilot study we observed children's behaviors related to trying new foods over the course of the 12 week program. Behaviors, such as smelling, ignoring, playing with, spitting out and swallowing the new food, were tracked.<sup>108</sup>

Figure 2-2 illustrates that at the outset of the program some children pointedly ignored the new food while others initially swallowed it and then, in subsequent weeks, declined to eat the food. Children also initially demonstrated more exploratory behaviors like smelling and playing with the food and putting the radish in their mouth and spitting it back out—all behaviors that child care providers report as annoying or irritating when they see them. Over the weeks, use of these exploratory behaviors declined. However, a concurrent increase in the percent of children who tried and swallowed the new food also occurred. This data suggests that children use a variety of strategies and senses to learn about food and eating—some of which adults find unpleasant.<sup>108</sup>

Figure 2-2: *Observed behavioral antecedents of children adopting food seeking or “sampling” behaviors*



Currently, the ‘Tasting Party’ activity and evaluation assesses the children’s willingness to try new foods. Teachers are asked to record how many children ‘tried and liked’, ‘tried and didn’t like’, and ‘didn’t try’ each of the 6 foods presented.<sup>109</sup> In the 2004 Tasting Party evaluation (N= 855), 89 percent of the children tasted all four of the new foods presented to them, while 95 percent tried the two program foods.

### ***Parent Component***

A bilingual parent component, *Family Fun with New Foods*, encourages parents to create an environment that provides children with multiple opportunities to learn about and try new foods at home. It is based on seven simple tips for offering new foods to kids. These tips are seen repeatedly through parent materials, including: newsletter articles, handouts, activity tips with recipes, and fun food activities for families. The parent component also includes educational enhancers, such as magnets and shopping lists, to remind parents to offer new foods to their families, especially young children.<sup>110,111</sup>

### ***Teacher Training Component***

Teachers are trained prior to classroom implementation on program materials, concepts, and child feeding issues. The teacher training component of the program is critical to the success of the program. Teacher training, classroom modeling, and program materials work synergistically to establish a positive feeding environment in the classroom for children to experience and try new foods.

### ***Rationale for Physical Activity Component***

As noted earlier, a strong need exists for a comprehensive, research-based, age-appropriate program addressing nutrition and physical activity for preschoolers. Because of this void, funding was attained by Colorado State University to develop and evaluate a physical activity program to compliment an existing successful nutrition education program, *Food Friends*®. Collectively, these programs have the potential to impact obesity prevention efforts in the preschool setting.

In developing the complimentary physical activity program, *Mighty Moves*<sup>™</sup>, strategies and the theoretical framework utilized in *Food Friends*<sup>®</sup> was used to design, implement and evaluate *Mighty Moves*<sup>™</sup>. The *Food Friends*<sup>®</sup> program is based on the tenets of social marketing and utilizes the constructs of the Social Learning Theory, and hence they were used in developing *Mighty Moves*<sup>™</sup>.

### **VIII. Theoretical Framework**

Behavioral change theories and social marketing strategies have been independently applied to numerous nutrition and health-related interventions with positive results. However, few published social marketing articles describe behavioral theory as part of the development of social marketing programs. The integration of behavior change theory and social marketing strategies has great potential to effectively facilitate the bottom-up development, implementation, and evaluation of theory-driven, health-related educational and behavioral-change program. Theory indicates what needs to be done to change behavior and social marketing provides direction for how to change the behavior.<sup>112</sup>

#### **A. Social Marketing**

Social marketing is an audience-focused, research-based process to plan, develop, implement, and evaluate programs that are designed to influence behavior of the target audience, in an effort to improve their well-being and/or that of the society of which they are a part.<sup>113</sup> Social marketing is a bottom-up approach to developing behavioral change programs that takes into consideration the wants, needs, values, and preferences of the members of the target audience.<sup>114</sup> It is reasoned that if the

clients direct the program development, it is more likely that the intervention will affect the desired behavior change.<sup>115</sup>

The defining features of social marketing emanate from marketing's conceptual framework and include exchange theory, audience segmentation, competition, 'the marketing mix,' consumer orientation, and continuous monitoring. Although social marketing shares many features with other related public health planning processes, it is distinguished by the systematic emphasis marketers place on strategic integration of the elements in marketing's conceptual framework.<sup>116</sup>

The most identifiable concept of social marketing is the 'marketing mix,' also known as the 4 P's: product, price, place and promotion. Product represents the desired behavior you are asking your audience to do, and the associated benefits, tangible objects, and/or services that support behavior change. Price is the cost (financial, emotional, psychological, or time-related) or barriers the audience faces in making the desired behavior change. Place is where the audience will perform the desired behavior, where they will access the program products and services, or where they are thinking about your issue. Promotion is often the most visible component of marketing. Promotion includes the type of persuasive communications marketers use to convey product benefits and associated tangible objects and services, pricing strategies, and place components. Collectively, the 4P's make up an integrated marketing strategy to accomplish the desired behavior change.<sup>116</sup>

The social marketing process is a continuous, iterative process described by Grier and Bryant as consisting of six major steps or tasks:<sup>116</sup>

1. Initial planning - This stage involves gathering relevant information to help identify preliminary behavioral objectives, determine target markets, and recognize potential behavioral determinants and strategies.
2. Formative Research – Formative research is conducted to investigate factors identified during the initial planning phase to segment audiences and determine those factors that must be addressed to bring about behavior change. It is used to gain a deeper understanding of a target audience's needs, aspirations, values, and everyday lives. Of special interest are consumers' perceptions of the products, benefits, costs, and other factors (e.g. self efficacy and social influences). To gather valuable insight into the target audience, Grier and Bryant recommend that social marketers use a mixed methodology of focus groups, surveys, and interviews to develop effective marketing plans.
3. Strategy Development – This step involves the preparation of a realistic marketing plan comprised of specific, measurable objectives and a step-by-step work plan that will guide the development, implementation, and tracking of the project. The plan includes the overall goals of the program, a description of the target audience, specific behaviors that will be marketed toward them, and strategies for addressing the critical factors associated with the target behavior. The social marketing plan is organized around marketing's conceptual framework of the four Ps.

4. Program Development and Pretesting – Campaign strategies and materials are then developed, pretested, piloted, and revised prior to program implementation. Pretesting is conducted to determine which concepts and materials resonate best with the target audience and to assess message appeal, recall and comprehension, sources of confusion or offense, and motivation to act. Siegel notes that pretesting materials will not tell researchers exactly how materials will perform, they will identify any ‘red flags’ in terms of unintended interpretations and executional details that need changing (typeface, type size, colors, music, voices, timing, etc). Pretesting ensures that the final versions of materials contain messages that are clear, effective, true to the strategy, easily understood by the intended audience and that they do not generate unintended reactions.<sup>117</sup> Results from pretesting efforts guide the program or campaign so concepts and materials can be tailored to the target audience.
  
5. Implementation – The implementation stage of the process includes enlisting collaborators, training key players, and disseminating program/campaign materials.<sup>118</sup>
  
6. Monitoring and Evaluation – Monitoring and evaluation activities continue throughout the program implementation to identify any necessary program revisions, as well as to understand program effectiveness and make midcourse corrections as needed.

Social marketing can be viewed as a planning framework that incorporates behavior change theory within the context of consumer orientation. The synergistic value of overlaying theory into social marketing efforts will allow health educators to better identify consumer values, and hence better reach the target audience.<sup>112</sup>

## **B. Social Learning Theory**

Previous research has emphasized that the most effective health programs are those that are behaviorally focused and based on appropriate theory.<sup>119</sup> The Social Learning Theory is one of the most frequently used behavioral change theories that focus on the interpersonal level.

The Social Learning Theory also referred to as the Social Cognitive Theory, addresses cognitive, emotional, and behavioral factors that underlie health behavior and the methods of promoting behavior change.<sup>120</sup> Bandura proposes that behavior can be explained and predicted through understanding the dynamic, three-way interaction between behavior, personal factors, and environmental factors known as reciprocal determinism.<sup>121</sup> Reciprocal determinism is one of several constructs of the Social Learning Theory (Table 2-4).

The Social Learning Theory asserts that people learn not only from their own experiences, but by observing the actions of others and the benefits of those actions. Further, it purports that if an individual has self-efficacy, they can change behaviors even when faced with obstacles.<sup>121</sup> Bandura believes that to help people reduce

Table 2-4: *Social Learning Constructs and Definitions*<sup>122</sup>

<b>Construct</b>	<b>Definition</b>
Reciprocal Determinism	Triad between behavior, environment, and behavior
Individual	Characteristics related to an individual - socio-demographics, culture, learning styles, cognitive stage
Environment	Physical (preschool & home), social (role models: teachers, parents & peers), and institutional structures (preschool) which affect individual characteristics and behavior
Behavior	Specific identified behavior
Behavioral Capability	Knowledge and skill to perform a given behavior
Self-Efficacy	Confidence in performing behavior
Social Support	Modeling and emotional support to promote behavior
Expectation	Evaluation of behavioral outcome
Expectancy	Value placed on behavioral outcome
Observational Learning	Behavioral acquisition that occurs by watching the actions and outcomes of others' behavior
Reinforcement	Incentives and rewards for performing behavior

health-impairing habits by health communications, the emphasis on trying to scare people into health needs to change to enabling them with the self-management and self-beliefs needed to take charge of their health status.<sup>123</sup>

Moreover, Rimal found that perceived self-efficacy determines whether individuals translate perceived risk into a search for health information and whether they translate acquired health knowledge into healthful behavioral practices. Those of low self-efficacy take no action even though they are knowledgeable about lifestyle contributors to health and perceive themselves to be vulnerable to disease.<sup>123-125</sup>

Maibach and colleagues found that both people's preexisting self-efficacy beliefs that

they can exercise control over their health habits and the self-efficacy beliefs instilled by a community health campaign contributed to adoption of healthy eating habits and regular exercise.<sup>123, 126</sup> Enhancing self-efficacy in health promotion efforts thus has great potential for attaining desired behavior change.

## **IX. Summary**

With the increase in childhood overweight, it has become apparent that interventions targeting the highest risk populations are needed. Preschoolers, as a whole, have been largely ignored when it comes to obesity prevention efforts. Because low-income, ethnic minority preschoolers are at greatest risk, Head Start has great potential as a program to implement and support obesity prevention efforts, including nutrition education and physical activity interventions.

Good nutrition and physical activity are important to the growth, development, and emotional well-being of young children and to their establishment of healthful lifestyles that prevent childhood overweight. Healthful behaviors are fostered by stimulating and encouraging environments in which children live and play, including preschool and Head Start centers. The addition of a physical activity component, *Mighty Moves*<sup>™</sup>, to the *Food Friends*<sup>®</sup> program has the potential to prevent obesity in low-income preschoolers.

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## CHAPTER 3

### FORMATIVE RESEARCH AND STRATEGIC DEVELOPMENT OF A PHYSICAL ACTIVITY COMPONENT TO A SOCIAL MARKETING CAMPAIGN FOR OBESITY PREVENTION IN PRESCHOOLERS

#### **Abstract**

The prevalence of overweight in childhood, including preschoolers, continues to rise. While efforts focusing on school-aged children are encouraging, obesity prevention programs to address nutrition and physical activity in the child care center are lacking. *Food Friends*® is a successfully evaluated nutrition program aimed at enhancing preschoolers' food choices, the addition of a physical activity program would improve the programs overall efforts to establish healthful habits early in life. This study describes the formative research conducted with secondary influencers of preschoolers –teachers and parents - for the development of a physical activity program. Key informant interviews and focus group discussions were conducted with preschool teachers and parents, respectively, to examine current physical activity practices, as well as attitudes, opinions, and desired wants and needs for physical activity materials. Findings illustrate that teachers provided physical activity; however, most did not use a structured program. Teachers identified time, space and equipment as barriers to providing activity in their classroom. Focus group findings identified activities of preschoolers', parents' perceptions of the adequacy of activity levels, and items to help parents engage their children in more

physical activity. Barriers were also identified by parents and included time, safety, inclement weather, and lack of knowledge and self-efficacy. Findings from this formative research were used to develop a marketing strategy to guide the development of a physical activity component, *Food Friends Get Movin' with Mighty Moves™*, as part of a larger social marketing campaign aimed to decrease the risk for obesity in low-income preschoolers.

## **Introduction**

The prevalence of overweight and obesity among Americans is increasing at an alarming rate. Between 1980 and 2002, obesity prevalence doubled in adults aged 20 years or older and overweight prevalence tripled in children and adolescents between ages 6 and 19 years.<sup>1</sup> Even our nation's preschoolers are affected. Among children ages 2 to 5, the prevalence of overweight increased from 7 percent in 1994 to 10 percent in 2000 to almost 14 percent in 2004.<sup>1,2</sup>

Good nutrition and physical activity are important to the growth, development, and emotional well-being of young children and to the establishment of healthful lifestyles that prevent childhood overweight. Unfortunately, neither the nutritional quality of preschoolers' diets nor their physical activity levels are adequate. Their diets tend to be high in total fat, saturated fat, sodium, and sugar, and low in fruits and vegetables, calcium-rich foods and fiber.<sup>3-5</sup> Additionally, preschoolers' physical activity levels are declining.<sup>6-8</sup> Between 1981 and 1997 children's free playtime decreased an estimated 25 percent; this change appears to be driven by increases in the amount of time children spend in structured activities, such as school, lessons or organized sports.<sup>7</sup>

Healthful behaviors are fostered by stimulating and encouraging environments in which children live and play. Approximately sixty percent of mothers with preschool-aged children are employed.<sup>4</sup> It is estimated that 40 percent of children aged 3 to 4 years of age, whose mothers are employed, spend more than 35 hours per week in non-parental care.<sup>9</sup> Thus, implementation of overweight prevention interventions where children spend a significant amount of time makes sense. While obesity prevention efforts for school-aged children are on the rise, little has been done to address the overweight epidemic during the preschool years.<sup>4</sup> Currently, an obvious void exists in research-based programs and interventions addressing both nutrition and physical activity in the childcare center.

The *Food Friends - Making New Foods Fun for Kids*® program is a blend of educational and marketing strategies with the primary objective of increasing children's willingness to try new foods and establish a strong foundation for a healthful diet.<sup>10-15</sup> This program has been evaluated to ensure changes in eating behavior are attained.<sup>13</sup> The addition of a comprehensive physical activity component to the *Food Friends*® program, *Mighty Moves*™, aims to enhance the program's overall efforts to establish healthful habits early in life. The development of the *Mighty Moves*™ physical activity component has mimicked the development of the *Food Friends*® program by encouraging fun and play through cartoon characters and utilizing social marketing tenets.

Social marketing typically is defined as a program planning process that applies commercial marketing concepts and techniques to promote voluntary behavior

change.<sup>16</sup> The social marketing process is a continuous, iterative process with a persistent focus on the target audience.<sup>16, 17</sup> It is reasoned that if the target population directs the program development, the intervention will more likely result in the desired behavior change. Formative research is one step of the social marketing process in which target audience input is sought.

After a health-related problem is identified, the target audience is critically analyzed by social marketers to ascertain their values, attitudes, opinions, interests, learning characteristics, occurrence of targeted behavior, and preferred media outlets. The social marketing process emphasizes that to develop an effective program intervention, researchers must understand what drives, facilitates, and maintains the behavior of the target audience, as well as the channels of information distribution and communication preferred by the target audience.<sup>18</sup> Results of formative research drive the development of a marketing strategy. This strategy is intended to steer the development, implementation, and tracking of the program.<sup>16</sup>

Strategy development involves the preparation of a realistic marketing plan comprised of specific, measurable objectives. The plan is organized around marketing's conceptual framework of the 4 P's: product, price, place and promotion. A product can include ideas, behavior changes, or something offered to satisfy a consumer's want or need. The price is the barrier(s) or cost(s) that may prevent the consumer from taking action. Place describes where the product can be obtained and identifies where to reach the consumer. Lastly, promotion encompasses the strategies, tactics and means used to communicate with the consumer.<sup>17</sup>

While three- to five-year old children are the primary target audience of the *Food Friends Get Movin' with Mighty Moves™* program, cognitive immaturity poses a challenge in gathering formative research directly from this audience. Thus, to gain insight into preschool-aged children's needs, wants and preferences, key informant interviews and focus group discussions were conducted with secondary influencers – teachers and parents, respectively. Findings from interviews with Head Start and preschool teachers and focus group discussions with parents are presented to provide insight into both the primary (preschoolers) and secondary (teachers and parents) audiences and how the information gathered during the formative evaluation phase was utilized for strategic development of the *Food Friends Get Movin' with Mighty Moves™* program. This research was approved by the Human Subjects Committee at Colorado State University.

## **Methods**

### ***Key Informant Interviews***

Recruitment letters and consent forms were sent to teachers (n=425) from 34 Head Start and preschool programs throughout Colorado who had participated in the *Food Friends®* program in previous years. Interested teachers returned a consent form, which contained their phone number and preferred days and times for researchers to call. These teachers were stratified by geographical location (rural, urban), type of preschool center (Head Start or preschool) and their participation in a previously offered physical activity program. Teachers were assigned to one of eight stratifications (e.g. Rural, Head Start, no previous program exposure).

A semi-structured telephone interview protocol was developed to identify teachers' barriers and motivators in implementing and promoting physical activity to preschool-aged children. Eighteen open-ended and one closed-ended question assessed teachers' attitudes, opinions, interests, learning characteristics, occurrence of targeted behavior, preferred mode of programming and materials, preferred means of education and information dissemination for families, and the program name. The protocol was tested for face and content validity by experts in the fields of health promotion, qualitative data collection, nutrition, health and exercise science, and occupational therapy to ensure acceptability and understandability of the question set. Sample questions from the question set are presented in Table 3-1.

Two trained interviewers conducted the interviews in English. Teachers were chosen randomly from each of the eight stratified groups. Time required for each interview ranged between 35 to 45 minutes. Teachers who participated in an interview received a twenty-dollar cash stipend and all teachers who returned a consent form were entered into a drawing for a one hundred-dollar cash prize. The majority of interviews were audio taped with consent of the participant and responses were transcribed. The initial three interviews were transcribed then reviewed by both interviewers. Responses were compared to assess and establish inter-rater reliability, then, the remaining interviews were conducted. Upon completion, audiotapes of the interviews were reviewed by a third individual to verify the content of the transcripts. Three reviewers independently reviewed the interview transcripts, categorized participants' responses, cross-verified one another's categorization, and identified common themes and descriptive quotations.

### ***Focus Groups***

Potential parent participants were recruited from four Head Start centers (n=4) that previously participated in the *Food Friends*® program. Of the four centers, two were located in rural areas and two in a large urban area. Research staff provided Head Start centers with bilingual recruitment flyers to encourage participation. Participants signed up directly with the Head Start. Spanish- and English-speaking parents were recruited to participate and assigned to one of two separate focus groups based on language preference. Prior to the focus group, participants received dinner; and at the completion of the focus group, participants received a twenty-dollar cash stipend.

Bilingual moderators, trained in focus group facilitation, led the groups.<sup>19</sup> Prior to the commencement of focus group sessions, the interview questions were tested for face and content validity by experts who also reviewed the key informant interview questions. Further, a mock focus group was conducted to evaluate flow and comprehension of questions.

During each focus group, the moderator moved systematically through a series of fourteen questions in English or Spanish. Questions probed participants' views about physical activity for their children and themselves, barriers to physical activity, desired program materials, and favorable program names. To ascertain that the demographics of the sample closely resembled the target population, participants' age, gender, and ethnicity were asked. Sample questions from the moderator's guide are presented in Table 3-1. Time required for each focus group's completion ranged between 90 and 120 minutes. All focus groups were audio-taped and handwritten notes were taken. Upon completion, audiotapes were transcribed and, if

necessary, translated to English. Three reviewers independently coded focus group transcripts; categorized participants' responses; cross-verified one another's categorization; and identified the common ideas, based on the number of responses per category, as well as descriptive quotations.<sup>19</sup>

## **Results**

### ***Key Informant Interviews***

Consent forms were returned by teachers (n=79) from seventeen Head Start and preschool centers (n=17), resulting in a 19% response rate from teachers and 50% response rate from centers. Research staff interviewed thirty-one teachers (n=31) from fifteen geographically diverse centers, seventeen teachers (n=17) represented rural centers and fourteen teachers (n=14) taught in urban areas. The teaching experience for the participating teachers ranged from one to thirty-nine years. Findings from the interviews can be divided into four broad categories: current practices, barriers, ideal program components, and training (Table 3-2).

#### *Current Practices*

All teachers reported they offer physical activity in the classroom; however, the offerings varied by type and duration. On average, teachers offer 10-20 minute sessions of structured physical activity and 30-40 minutes of outdoor unstructured 'playtime' each day. For the structured physical activity sessions, teachers tended to use a mix of various music and movement CD's and activity ideas they had "collected through the years," rather than a formal curriculum. Specific activities tended to be theme-driven or imaginary trips and journeys, such as to the ocean and outer space: "A lot of physical things are tied in with other things we do – farm,

animals, and transportation – lots of pretend.” Other activities included games, like *Duck, Duck, Goose* and *Simon Says*, which a teacher described as, “lots of movement kinds of activities involving listening and movement.”

Teachers felt the amount of time devoted to physical activity during the school day was adequate: “We do enough for the time allotted.” Many acknowledged they would like to do more, but the current amount “works for us because of the other stuff we have to fit in.” Several teachers remarked that the amount of physical activity offered was good for the average child; but, “for the child who doesn’t get any at home or is obese – it’s not enough.” One teacher expanded on this idea and noted, “Some kids do not have a chance for physical activity...because they live in unsafe neighborhoods.” While another teacher stated: “If we weren’t giving it to them, they wouldn’t get enough.”

### *Barriers*

Teachers consistently listed time, space and equipment as barriers to offering physical activity in the classroom. Space appeared to be the largest barrier, with no differences seen between rural and urban centers. One teacher stated, “We just don’t have good space to get really involved in physical activity.” Another added: “I wish we had a designated room for movement.” Time was also a barrier and one teacher remarked that physical activity “tends not to be a priority and we may skip it due to other priorities.”

### *Ideal Program Components*

When asked to describe what would make an ideal physical activity program,

teachers responded that sessions should be 15-20 minutes long and easy to incorporate into each school day. The activities should "...help with large motor [skills]" and must "keep kids imaginations engaged." Materials should include a variety of music and support theme-driven activities while enhancing school readiness skills: "Including themes will reinforce other areas of the classroom. We can build on things at different times of the day." In general, activities should build upon themselves throughout the school year and allow for different ability levels.

Head Start teachers indicated that lessons must be tied to the Head Start Child Outcomes Framework. Overwhelmingly, teachers stated that materials should be "all inclusive" so that little effort or preparation was required by them: "[There is] pressure for having to cover so many things, so materials for physical activity should be put together in a teacher friendly way." Another teacher commented: "Make it easy, little preparation for us. If it is just there, I'd be more willing to do it."

In addition to considering what they would like in the classroom, several teachers remarked that "having a parent education piece with it is big." Another teacher mentioned that by "modeling at school, especially for those more sedentary at home, [concepts] may carry over to the parent." To reach parents they "must have materials in Spanish." Lastly, as part of an ideal program, teachers felt hands-on training it would be necessary with "lots of demonstration."

### *Training*

The majority of teachers had not had any formal training on physical activity or motor skill development for preschoolers: "I don't know guidelines and what is appropriate

for this age. I think there was a lack of specific education on physical activity for young children so teachers were not trained [on it].” Teachers remarked that they would like to be trained prior to implementing a structured activity program. When probed for what the training should cover, one teacher stated that it should include information about “the importance of physical activity and how it can help us [teachers] meet our agenda.” Another teacher pointed out “it should be hands-on and fun.”

When teachers became aware during the interview that researchers were interested in developing a physical activity program to compliment the *Food Friends*® program, all were very supportive of the idea. Some responded by re-emphasizing what they would like. For example: “Try to make curriculum different than [the materials] that we have. I’m looking for more innovative, interesting ways to move with my kids.” Others re-stated the need for structured activity programs for this age group, “I think it [physical activity program] is something we really need; you know, we can always use new things and ideas.” As described next, similar comments were iterated by parents during focus groups.

### ***Focus Groups***

Seven focus groups – four English and three Spanish – were conducted with forty-five low-income parents/caregivers (n=45). Participants were of mixed gender, ethnicity and age and representative of the Colorado Head Start population (Table 3-3). The focus groups provided insight into activities and interests of preschoolers at home, determinants to engage preschoolers in physical activity, items to encourage

preschoolers to be more active, physical activity habits of parents, items to engage parents in more physical activity, and program name (Table 3-2).

### *Activities and interests of preschoolers at home*

The focus groups started with parents identifying the types of activities their preschoolers enjoyed. These consisted of playing with their toys (e.g. trucks and dolls), using their imagination (e.g. playing with their imaginary friends, dress-up, or pretending to be superheroes), dancing, reading, and watching television.

Preschoolers physical activities were identified as running, jumping, swimming, dancing, games (e.g. hide-n-go seek) and chore-like activities. Parents believed physical activity was important to their children's growth, as illustrated with this quote: "I believe that physical activity is important for physical health, mental health and also emotional health."

### *Determinants of engaging preschoolers in physical activity*

When asked if the amount of activity their preschooler received was adequate, in general, those in rural areas felt their children were getting plenty of physical activity except during inclement weather. One parent remarked, "Winter is so long here and they don't get the chance to go outside as much." In urban areas, parents felt their children could be more active: "I think that mine could get more, a lot more." They noted, however, that it was a challenge to provide children with physical activity opportunities because of safety and environmental concerns. Both rural and urban parents stated that they can tell when their children have had enough exercise because they sleep better, have less behavioral problems, and are not as sick as

often. One parent summed up feelings shared by many parents, "We definitely notice when they don't get enough... they bounce off walls when they are not active."

Parents identified barriers to being active with their preschoolers as time, safety, lack of knowledge, and the environment were strong themes. One parent summarized the barriers in her response: "Your environment, your house, your yard." Other specific examples included:

- "My kids can't play outside because there is lead in the backyard. [We are moving but] where we are going now does not have a backyard."
- "I have to be outside with my kids [because it's dangerous], but when I am home I don't want to be outside, because I have to do this, do that, clean this, clean that, make this dinner, make that dinner and I don't have time to do all that when I am watching them."
- "Now living in an apartment, you just can't do anything at anytime. My daughter, she likes to jump rope, and she will be jumping in her room [at 8:00 at night] and I will be like "You can't jump rope up here, you have neighbors downstairs. So then she will ask to watch TV."
- "Maybe we could exercise inside the house, but I don't demonstrate because I have never done it before. Maybe we could make it a routine, but I don't know too much about exercise, not even how to stretch a muscle. I have no idea."

While many parents identified barriers, others did see their environment as being conducive to being more active: “I walk everywhere, because we do not have a car. We pull the kids in a wagon or they ride their bikes. We walk everywhere.”

#### *Ideas to encourage preschoolers to be more active*

Parents strongly agreed that they, themselves, were a significant contributor to their children’s activity habits. For example, one parent remarked, “I think parent involvement is key.” Another parent continued, “Everything starts at home, if you’re not active, they’re not active.” In addition to motivating parents to be active and role model for their children, parents stated that “what we need is information.”

Specifically, “Having ideas for what to do indoors would be helpful.” Parents elaborated that music, videos, and equipment would be good tangible items to help them engage their preschooler in activity. Many commented that the program and materials should encourage creative play and use characters and/or superheroes as a way to communicate program messages.

#### *Physical activity habits of parents*

Parents in these focus groups did not participate in regular physical activity. Rather, their activity comes from work or by “chasing the kids around the house.” While several parents stated “I am constantly at work...” or “I am on my feet 24/7 at work,” others commented “I don’t exercise,” or “I am lazy.” One participant commented: “I would just go [to the park] and sit and [my children] would go play, and they would be like, ‘Can you swing me?’ and I would be like ‘No, have your sister do it.’ No, no, how about I get up and do it. So, now I am starting to get up and swing them. You see some parents putting their kids up on the swing or putting their kid on the

monkey bars and so, they are doing activity as well. They are getting more than we are, but I have to get it in my head to stop being lazy.”

*Items that would help engage parents in more physical activity*

Having more time, childcare, a friend or group to be active with and free classes were items parents indicated would help them be more active. Childcare was a very strong barrier for this audience, as one participant stated, “It’s hard for me to ask someone to take care of my children because everybody has to work, and especially just to go exercise.” Many indicated that family-based activities were better than activities suited just for them or just for the child: “If you want the parents to be involved, it would be good to have activities that they can do together and involve the whole family.” Additionally, several parents commented that “[The program/materials] would have to be bilingual.”

*Program name*

Potential program names were also tested with both teachers and parents. Six names which were a mix of fun and playful names as well as health-oriented names were presented to the participants. Participants remarked that the children would be more excited and better identify with names containing words like “wiggle”, “stomp”, and “fun” versus “healthy” and “fit”. While agreement on the concept likes and dislikes occurred, a consensus name did not emerge from this portion of the research. However, based on this input, a marketing firm developed and tested additional names with preschoolers to establish the *Mighty Moves* program name.

## **Discussion**

Formative research is a key step in the social marketing process as it aims to identify what the target audience needs and wants, so a public health product can be created, framed and packaged accordingly. This study provides insight, through interviews and focus groups, into physical activity practices, beliefs, barriers, and desired materials for teachers and parents of preschool-aged children. Information obtained through this formative research was then applied to the development of a marketing strategy, utilizing the marketing mix's 4 P's, for the *Food Friends Get Movin' with Mighty Moves™* program.

### ***Formative Research***

The family environment plays an important role in the development of children's health behaviors.<sup>20</sup> Several studies have shown a positive relationship between parental physical activity and their children's physical activity<sup>8, 20-22</sup>. Because parental influence can impact the physical activity habits of young children, when designing an activity program to reach preschoolers, ascertaining the parents' attitudes, opinions, interests, and current behaviors around physical activity as well as their ideas on desired program concepts and materials was critical.

Themes and outcomes from parent focus groups reported here are similar to other findings.<sup>9, 23, 24</sup> In the current study, parents identified time, child care, environment (safety and weather) and lack of knowledge and confidence as key barriers in preventing participation in physical activity. Similarly, Irwin found that time, resources, safety concerns, and weather were factors which either facilitated or hindered activity levels.<sup>24</sup>

One difference among urban and rural parents was found and it related to whether or not their child received enough physical activity. Rural parents felt their child received adequate amounts most of the time, with the exception of inclement weather, but urban parents felt challenged because of safety and environmental concerns. Parents stated that, when their children get enough activity, they sleep better and they have less behavioral problems; but, snow on the ground for a large part of the year and unsafe neighborhoods make it challenging for the kids to “get out of the house and run around.” While the reasons were different for rural and urban families, parents agreed that having activities they could do indoors with their children would be helpful.

While parental influence on young children’s activity levels can be significant, children spend a substantial amount of time in child care. Studies have found the childcare center to be a strong determinant of children’s physical activity.<sup>6, 9, 25</sup> Thus, the childcare setting and its teachers/providers play an important role in offering and modeling of physical activity programming and motor skill development.

Physical activity offerings in the childcare setting vary in amount and quality.<sup>25</sup> While Head Start federal regulations require opportunities, equipment, and space for indoor and outdoor play, the regulations do not specify the amount, frequency or durations of physical activity.<sup>4</sup> Further, preschools are regulated by states and state physical activity guidelines vary considerably. To better comprehend what was occurring with physical activity in the Colorado preschool setting, interviews with teachers ascertained current practices, materials, barriers, and training needs.

The interviews revealed most teachers felt the 15-20 minutes in the classroom and 30-40 minutes of unstructured play time each day were sufficient for the time they had with the children, but acknowledged that their students might not be active enough overall. Barriers to providing physical activity in the classroom included time, space, and equipment. Very few teachers used structured or formal curricula; rather music and equipment were a collection of what they had gathered. Training on physical activity and motor skill development were identified as a need. Moreover, teachers described their ideal physical activity program as one with 15 minute daily sessions, and included music and theme-driven activities, linked to outcome measures, built upon itself throughout the school year, had a bilingual parent component, and provided hands-on training and demonstration prior to program implementation.

Few differences were found when examining teacher responses by their stratification - geographic location (rural or urban), setting (Head Start or preschool), and exposure to a past activity program). Barriers such as time, space, and equipment appeared to be independent of geographic location; however, space appeared to be dependent on the location of the center within the community (e.g. church, elementary school, community center, etc.). Head Start teachers did appear to be a bit more concerned with time and their ability to 'fit everything in.' They also mentioned tying activities/lessons to outcome measures more so than preschool teachers. Teachers who had experience with a past physical activity program did not provide different information than teachers who were not exposed. Teachers who were exposed to the program only mentioned it under materials/curriculum they

were currently using and alluded to it as the only training and/or exposure to physical activity they had had for this age group.

### ***Strategic Development***

Based on the themes and outcomes from the formative research, a strategy, utilizing the marketing mix, was developed by research staff and marketing experts. It was determined that the product, or desired behavior, would be to enhance preschoolers' physical activity levels through increased opportunities. While the product aims to change behaviors in young children, a strategy was developed for each of the secondary audiences – teachers and parents – because of their roles as gatekeepers in offering and encouraging physical activity in two selected places – the preschool classroom and the home environment (Tables 3-4 and 3-5). The price and promotion of the product were customized to the needs, wants and barriers of teachers and parents. The price represents the barriers identified during the interviews and focus groups. Time, space and equipment were identified by teachers as costs that would likely keep them from offering physical activity opportunities in the classroom. Likewise, the price for parents was time, safety and their environment as well as lack of knowledge and self-efficacy.

Further, it was determined that promotion of the product would utilize and expand the existing *Food Friends*® concepts and characters. Materials would be designed to capture children's imaginations and engage them in dramatic play while also taking into account developmental and age appropriateness. Teachers would be provided with lessons and activities prepared for them and which supported the Head Start Child Outcomes Framework.<sup>26</sup> Necessary materials and equipment to

support lessons and activities would be provided to teachers for use in their classroom. Further, a hands-on training would be offered to teachers as part of the program. Materials for parents would aim to enhance knowledge and self-efficacy in offering and modeling physical activity to their young child. Moreover, materials would be child-friendly and allow for preschoolers to promote program concepts to parents. Cost and feasibility for development of audio and/or video materials would be explored. Lastly, a child-friendly program name would be developed and pretested with preschool-aged children as well as teachers and parents.

### ***Limitations***

The results of this study are subject to several limitations. First, participants in both the key informant interviews and focus groups were a convenience sample, selected from those Head Start programs where existing nutrition program efforts were being implemented by researchers. Further, selection bias may have occurred as only those teachers and parents who were interested in the topic or motivated to participate took part in the study. For focus groups, social desirability bias can emerge in group settings'; thus, participants may have answered questions differently than they would have if they were interviewed one-on-one. Lastly, because focus groups were conducted with a low-income, Hispanic and Caucasian audience, these results are not generalizable to the larger population of parents of preschool-aged children. However, while not generalizable, the results may be transferable and can be applied to future research projects working with this audience.

## **Conclusions**

The prevalence of overweight and obesity among U.S. children continues to be a leading public health concern. Head Start and preschool centers offer untapped opportunities to implement effective obesity-prevention strategies to reach both children and parents.

Findings from this formative research with preschool teachers and low-income parents of preschoolers were used to develop a marketing strategy to guide the development of a physical activity component, *Food Friends Get Movin' with Mighty Moves™*, as part of a larger social marketing campaign aimed at preventing obesity in low-income preschoolers. Completion of the formative research and marketing strategy leads into the next step in the social marketing process, program development.

**Table 3-1:** Selected Interview and Focus Group Questions and Probes

<b>Key Informant Interview Questions – Teachers</b>
<p>Does your school offer physical activity programs to kids? Parents? Staff?</p> <p>What physical activities, rhythmic movements, and games, do you currently do with your class?</p> <ul style="list-style-type: none"> <li>- Probe for frequency, duration and names of structured curricula they may be using</li> </ul> <p>What do you think about the amount of physical activity in your classroom?</p> <ul style="list-style-type: none"> <li>- Probe for interest in more or less; perceived benefits and costs of physical activity</li> </ul> <p>If a structured physical activity program were to be conducted in your classroom what would you want it to look like?</p> <ul style="list-style-type: none"> <li>- Probe for frequency, duration, type;</li> <li>- Probe for how activity can be tied into things that you are already doing in the classroom?</li> </ul> <p>What things would make it easier for you to teach structured physical activity?</p> <ul style="list-style-type: none"> <li>- Probe for details (time, training, assistance, materials, priority, equipment, space, experience)</li> </ul> <p>What are the barriers to teaching structured physical activity with your preschoolers?</p> <ul style="list-style-type: none"> <li>- Probe for details (time, priority, equipment, space, experience, etc.)</li> </ul> <p>What suggestions do you have as to how we can use the <i>Food Friends</i>® characters to weave physical activity into the school day?</p> <ul style="list-style-type: none"> <li>- Probe for what types of activities the characters may be shown doing</li> </ul> <p>What type of training have you received for leading physical activity for preschool?</p> <p>What would you like to see in staff training for teaching physical activity?</p>
<b>Focus Group Questions – Parents</b>
<p>How does your preschooler fill their time at home?</p> <p>When it comes to health and your preschooler what comes to mind?</p> <p>What types of physical activity do your preschoolers participate in?</p> <p>How do you feel about the amount of physical activity that your preschooler participates in each day?</p> <p>What type of things would be helpful for you to engage your preschooler in more physical activity?</p> <p>What barriers might there be for your preschooler to participate in physical activity?</p> <p>What types of physical activity do you participate in?</p> <p>What would make it easier for you to participate in physical activity (without your child)?</p>

**Table 3-2:** Summary of Common Themes from Teacher Interviews and Parent Focus Groups

<b>Summary of Common Themes</b>
<b>Teacher Interviews</b>
<p><b><i>Current Practices</i></b></p> <ul style="list-style-type: none"> <li>•On average, teachers offer 10-20 minute session of structured physical activity and 30-40 minutes of outdoor unstructured 'playtime'.</li> <li>•Various activities and materials including music and theme-driven activities are used, but no formal curriculum was used.</li> </ul> <p><b><i>Barriers</i></b></p> <ul style="list-style-type: none"> <li>•Include time, space, and equipment</li> </ul> <p><b><i>Ideal Program Components</i></b></p> <ul style="list-style-type: none"> <li>•15-minute sessions engaging children's imaginations</li> <li>•Activities include a variety of music and theme-driven activities while enhancing school readiness skills</li> <li>•Activities/lessons are linked to Head Start Child Outcomes Framework</li> <li>•Parent component to go home with materials in both English and Spanish</li> </ul> <p><b><i>Training</i></b></p> <ul style="list-style-type: none"> <li>•Few teachers had any formal training in physical activity or motor development</li> <li>•Teacher training prior to implementation that includes demonstrations and participation preferred.</li> </ul>
<b>Parent Focus Groups</b>
<p><b><i>Activities and Interests of Preschoolers at home</i></b></p> <ul style="list-style-type: none"> <li>•Non-physical activities: Playing with toys, using imaginations, dancing, reading, watching television</li> <li>•Physical activities: Running, jumping, dancing, swimming, games (e.g. Hide-n-go seek), and chore-like activities</li> </ul> <p><b><i>Determinants to engage preschoolers in physical activity</i></b></p> <ul style="list-style-type: none"> <li>•Amount of physical activity: Rural felt children were getting plenty except when inclement weather; Urban felt it was a challenge because of safety and environmental concerns.</li> <li>•Barriers: parents lack of physical activity, time, safety, money, and information; environment</li> </ul> <p><b><i>Items to help encourage preschoolers to be more active</i></b></p> <ul style="list-style-type: none"> <li>•Parent role modeling, ideas for indoor activities, music, video, equipment, encourage creative play, use characters/superheroes</li> </ul> <p><b><i>Items to engage parents in more physical activity</i></b></p> <ul style="list-style-type: none"> <li>•More time, child care, free classes, someone to do it with, family activities</li> </ul>

**Table 3-3:** Study Population Demographics Compared to Parent Population Demographics (percentages) <sup>27</sup>

Demographic	Study Population			Parent Population State Head Start Data 2004-05
	Urban n=22	Rural n=23	Total n=45	
<b>Gender</b>				
Female	77.3	73.9	<b>75.6</b>	
Male	22.7	26.1	<b>24.4</b>	
<b>Age</b>				
18-34	50	69.6	<b>60</b>	
35-44	40.9	26.1	<b>33.3</b>	
45-59	4.5	4.3	<b>4.4</b>	
60-74	4.5	0	<b>2.2</b>	
<b>Ethnicity</b>				
Non-Hispanic White	9.1	65.2	<b>40</b>	<b>32.9</b>
Hispanic	86.4	34.8	<b>57.8</b>	<b>60.8</b>
Other	4.5	0	<b>2.2</b>	<b>13.4</b>
<b>Dominant Language</b>				
English	41	87	<b>64</b>	<b>61.9</b>
Spanish	59	13	<b>36</b>	<b>34.8</b>
Other	0	0	<b>0</b>	<b>3.3</b>

**Table 3-4:** Marketing Mix for the Classroom Component of the Food Friends® Physical Activity Component

Social Marketing Concept	Applications for Teachers/Classroom
Product	<p><i>Long-term:</i> Decrease the upward trajectory of weight gain in young children during the preschool years</p> <p><i>Short-term:</i> Enhance preschoolers physical activity levels through increased opportunities in the preschool and home environments</p>
Place	Head Start and preschool classrooms
Price	<p><i>Time</i> - program materials should be packaged together. Written materials should be presented in a teacher friendly manner and require little preparation</p> <p><i>Space</i> - activities should be designed for small spaces</p> <p><i>Equipment</i> - any necessary equipment should be provided</p>
Promotion	<p>Develop child-friendly program name and concept</p> <p>Utilize existing <i>Food Friends</i>® program concepts and characters</p> <p>Design materials to engage children's imagination and promote dramatic play</p> <p>Design developmentally- and age-appropriate lessons and materials</p> <p>Provide hands-on training on physical activity, gross motor skill development, and program implementation</p> <p>Develop lessons in accordance with the Head Start Child Outcomes</p> <p>Package and brand materials so they are self-contained in a large bin</p> <p>Materials may include: Written program activity binder, musical CD, various sized balls, beanbags, rope, scarves</p>

**Table 3-5: Marketing Mix for Parent Component of the Food Friends'® Physical Activity Component**

Social Marketing Concept	Application for Parents/Home
Product	<p><i>Long-term:</i> Decrease the upward trajectory of weight gain in young children during the preschool years</p> <p><i>Short-term:</i> Enhance preschoolers physical activity levels through increased opportunities in the preschool and home environments</p>
Place	Home and Community Environment
Price	<p><i>Time - program should provide ideas and examples of activities that families can do with little equipment and preparation</i></p> <p><i>Safety and Environment - program should provide indoor activity ideas to accommodate for inclement weather and/or safety concerns</i></p> <p><i>Lack of knowledge/confidence - program should aim to increase parental knowledge and self-efficacy</i></p>
Promotion	<p>Develop parent tagline/message</p> <p>Utilize existing <i>Food Friends</i>® program concepts and characters</p> <p>Design materials to engage children's imagination and promote dramatic play</p> <p>Design developmentally- and age-appropriate lessons and materials</p> <p>Design materials to allow for preschoolers to promote program concepts to parents</p> <p>Provide audio and/or video materials to assist parents to engage preschoolers in physical activity</p> <p>Enhance knowledge and self-efficacy of parents through behaviorally focused materials</p> <p>Materials may include: Musical CD, bilingual educational handouts, materials providing interactive activities for the entire family</p> <p>Classroom teachers will disseminate materials</p>

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## CHAPTER 4

### INTEGRATION OF SOCIAL MARKETING ELEMENTS IN THE DESIGN OF A PHYSICAL ACTIVITY PROGRAM FOR PRESCHOOLERS

#### **Abstract**

As obesity rates in young children continue to rise, the need for innovative nutrition- and physical activity-focused programs is apparent. With limited preschool obesity prevention efforts, a physical activity program, *Food Friends Get Movin' with Mighty Moves™*, has been developed to compliment a successful nutrition social marketing campaign, *Food Friends®*. Building off of formative research findings, this paper focuses on two other stages of the social marketing process, the strategy development and program development, and how elements of the marketing framework were integrated into the design of *Mighty Moves™*. Input from children, teachers, and early childhood specialists greatly contributed to strategy refinement, solidification of the exchange principle, and program development, thus increasing the likelihood that the intervention would affect the desired behavior change, or product. Superhero graphics were developed for the program as well as creative and engaging program concepts and materials.

## Introduction

The prevalence of overweight in preschool-aged children has increased considerably in recent decades. It is estimated that 13.9 percent of preschoolers in the United States are overweight and 26.2 percent are at risk for overweight. Minority children appear to be at greatest risk: 19.2 percent and 13.0 percent of Mexican-American and African-American 2- to 5-year olds, respectively, are overweight. In comparison, 11.5 percent of white children aged 2- to 5 are overweight.<sup>1</sup>

Despite the increasing rates of preschool overweight, most obesity prevention efforts have focused on the school-aged child. It is thus apparent that efforts for preschool-aged children, focusing on nutrition and physical activity, to decrease the upward trajectory of weight gain and to establish healthful habits, are needed.

*Food Friends- Making New Foods Fun for Kids*® is a successfully evaluated social marketing campaign aimed at increasing children's willingness to try new foods in an effort to enhance food choice, and hence dietary variety.<sup>2-4</sup> A physical activity companion program, *Food Friends Get Movin' with Mighty Moves*™, has been developed to improve the programs' overall efforts to establish healthful habits that prevent childhood overweight early in life. Like *Food Friends*®, the social marketing steps and framework were utilized to plan, develop, implement, and evaluate *Mighty Moves*'™ ability to increase physical activity, physical fitness, and gross motor skill development in 3- to 5-year old children.

As described by Grier and Bryant, the social marketing process is a continuous, iterative process consisting of six major steps or tasks: initial planning; formative

research; strategy development; program development and pretesting; implementation and evaluation. While these steps are similar to other public health planning processes, the emphasis marketers place on the integration of elements in marketing's conceptual framework distinguish social marketing from other processes.<sup>5</sup> This framework includes exchange theory, audience segmentation, competition, "the marketing mix," consumer orientation, and continuous monitoring.<sup>5</sup>

This paper focuses on two stages, the strategy development and program development stages, and how elements of the marketing framework were integrated into the design of *Mighty Moves*<sup>TM</sup>. Specifically, how consumer research, with both preschoolers and teachers, drove the enhancement of the marketing mix, and solidified the exchange principle which led to program development. The initial planning and formative research stages provided a strong foundation from which the *Mighty Moves*<sup>TM</sup> strategy and program were developed.

### ***Initial Planning***

Because *Mighty Moves*<sup>TM</sup> is a companion program to the *Food Friends*<sup>®</sup> nutrition program, several marketing elements had already been determined during initial planning, specifically the audience, product and place.

- *Audience segmentation*

Formative research conducted during the development of *Food Friends*<sup>®</sup> determined 3- to 5-year old children as the primary target audience.<sup>4</sup>

However, because of cognitive immaturity of preschoolers, and the role of

preschool teachers and parents as decision makers in young children's lives, teachers and parents were identified as secondary influencers. Additionally, the lack of obesity prevention programming in this audience further contributed to the decision to continue focusing on preschool-aged children.

- *Marketing Mix*

**Product:** As described earlier, the prevalence of overweight in preschool-aged children continues to rise at dramatic rates. Because low levels of physical activity can predispose children to obesity later in life, it is essential to begin promoting physical activity as early as preschool.<sup>6</sup> Thus, the products were determined to be:

- Long term: Decrease the upward trajectory of weight gain in young children during the preschool years.
- Short term: Enhance preschoolers' physical activity levels through increased opportunities in the preschool environment.<sup>7</sup>

**Place:** Because low-income, ethnic minority preschoolers are at greatest risk, Head Start has great potential as a program to implement and support obesity prevention efforts, including nutrition education and physical activity interventions. Further, Head Start federal guidelines require that settings provide opportunities for outdoor and indoor active play, adequate indoor and outdoor space, equipment for active play, and opportunities to develop gross and fine motor skills.<sup>8</sup> This, in conjunction with 8 years of successful

implementation of *Food Friends*® in Head Start centers, drove the decision to continue to place the product there.

While initial planning determined the audience, product and place, this was verified by the target audience in sequential stages: formative research and strategic development. Moreover, formative research, conducted with teachers and parents, identified components of price and promotion.

### ***Formative Research and Strategy Development***

Key informant interviews and focus group discussions were conducted with Head Start and preschool teachers and parents, respectively, to examine current physical activity practices, as well as attitudes, opinions, and desired wants and needs for physical activity materials. Findings, reported elsewhere, assisted in defining the initial price and promotion for the *Mighty Moves*™ classroom component.<sup>7</sup>

- ***Competition***

Formative research identified that the main competition for teachers in providing physical activity in the classroom as other academic enrichment activities, such as reading, writing, and arithmetic. Because of the large number of mandates placed on Head Start staff, in conjunction with the limited time teachers have with students, providing structured physical activity programming was thought of as a 'special' activity versus an 'everyday' activity.<sup>7</sup> Incorporating school readiness skills into physical activity lessons would assist in decreasing the competition for time.

- *Marketing Mix*

Price: As gatekeepers, teachers identified time, space and equipment as costs that would likely keep them from offering physical activity opportunities in the classroom. Teachers also mentioned concern that children who were shy, overweight, or had a physical disability may be hesitant to participate. Overcoming their reservations would be a cost for some children.

Promotion: It was determined that promotion of the product would utilize and expand the existing *Food Friends*® concepts and characters. A superhero theme was overwhelmingly identified as a fun and creative way to excite this age group about physical activity. Materials would be designed to capture children's imaginations and engage them in dramatic play while also taking into account developmental and age appropriateness. Teachers would be provided with lessons and activities as well as any necessary materials. Lastly, a hands-on training would be offered to teachers as part of the program.<sup>7</sup>

While formative research provided great insight into the wants and needs of teachers and preschool-aged children, the information was still broad and greater insight was needed, specifically for strategy development and refinement as well as program development. Input from children, teachers, and early childhood specialists greatly contributed to strategy refinement, solidification of the exchange principle, and program development, thus increasing the likelihood that the intervention would

affect the desired behavior change, or product. The pretesting and program development research are described within this paper. This research was approved by the Human Subjects Committee at Colorado State University.

## **Methods**

### ***Graphic Design and Pretesting***

Results from the formative research and the initial marketing mix were shared with the same marketing company who has worked on the *Food Friends*® campaign since inception. Market research of several concepts and potential graphics was conducted with preschoolers by the marketing firm. Based on these results, and input from the research team (experts in nutrition, occupational therapy, physical education, and health promotion) it was determined that several graphics would be designed: a group graphic with all the *Food Friends*® characters dressed as superheroes, including a new character 'Bonnie' Bean; individual graphics of each of the *Food Friends*® dressed as a superhero; individual graphics with each of the *Food Friends*®, dressed as a superhero, partaking in a physical activity. Three rounds of graphic pretesting with children and teachers were necessary before a consensus was achieved.

In Round I several methodologies were used. First, it was important to ensure that the characters were equally appealing to children. Individually, children were presented with 8 cards (8.5"x5.5") which each had a picture of a *Food Friends*® character dressed as a superhero. Children were given a minute to examine the pictures prior to being asked to pick out their favorite picture. That picture was removed from the table, and they were asked to pick out their next favorite. This

was repeated until all cards were selected, and a rank order was achieved to assess if differences existed by gender. Secondly, the child was shown 8 cards (8.5"x5.5"), one at a time, with a graphic of the *Food Friends*® character doing a physical activity. The child was asked to identify what the character was doing and what they liked best and least about the picture. At the conclusion of this set of cards, the child was asked what types of physical activity they liked to do. Next, the group graphic was shown to the child. With this graphic the child was asked whether or not they liked superheroes, if they wanted to have 'Mighty Moves' like the *Food Friends*®, and what the new character, Bonnie/Bella Bean, was. Lastly, teachers were shown each of the graphics and asked their opinions. Each child interview lasted no longer than 5 minutes and was conducted in either Spanish or English, depending on the child's dominant language. Demographic information, including age, gender, and ethnicity, were collected. Statistically, the Kruskal-Wallis one way analysis of variance (ANOVA) by ranks test was conducted to determine if a difference in ranking of characters existed by gender. Data were then analyzed using the Statistical Package for Social Science (SPSS 15.0 Windows; SPSS, Inc., Chicago, IL) program.

Results from Round I were analyzed, and recommendations for changes/modifications were presented to the marketing firm. Subsequently, new graphics for some of the characters were developed and modifications to the group graphic were made for Round II. With the exception of rank order, methodologies used in Round I were repeated. Additionally, children and teachers were presented with two options for the name of the new *Food Friends*® character – Bonnie Bean and Bella Bean. For Round III, changes to the physical activity for 3 characters were

made and slight modifications to other characters (e.g. cape color, type of ball) were made. Identical pretesting methodologies to Round II were used. Each round of pretesting was conducted at a different Head Start site throughout the state. A total of four sites participated, one each for the first two rounds, and two centers for Round III.

### ***Teacher Group Discussions***

Group discussions were conducted with teachers to assess the current strategy for development of the *Mighty Moves*<sup>™</sup> classroom component. Two discussions were held at two geographically distinct Head Start centers. Teachers were recruited by a Head Start center coordinator, who also assisted in setting up the time and place. During the discussion, teachers were presented with an outline detailing proposed program components – 18 weeks in length, 15 minute lessons 4 days per week, superhero theme, music, equipment/material ideas, concepts, and such. Further, they were shown several examples of lesson layouts and asked how they would like the curriculum/lesson outlines packaged – a binder, box, clip, or other. An informal question set was followed for each of the groups. Lastly, demographic information was collected on each participant. Each discussion group took approximately 1 hour and teachers were compensated \$20 for their time.

### ***Strategy Refinement and Program Development***

Based on results from graphic testing and teacher group discussions, refinements to the *Mighty Moves*<sup>™</sup> strategy and marketing mix were made. Additionally, the components in the exchange theory were solidified. These modifications were discussed with the marketing firm and research team. Feasibility and

appropriateness of materials suggested by teachers were also discussed. Program concepts were confirmed and materials were drafted.

### ***Teacher Pretesting***

Early childhood specialists were invited to review program components and *Mighty Moves™* materials after initial development. Teachers were mailed a packet containing the program background and concepts, *Food Friends®* superhero graphics, an outline of program materials, the *Food Friends Get Movin' with Mighty Moves™* musical CD, and a list of questions to consider. Questions related to concepts and materials for teachers to consider included: age- and developmental appropriateness of materials; content and themes; appropriateness and design of supporting materials; and comments in general. Teachers were asked to write or type their comments and return them and any notes to the research team within a two week time frame. Teachers were compensated \$40 for their time for each review.

## **Results**

### ***Graphic Design and Pretesting***

Graphics were tested with 93 children of mixed gender, age and ethnicity during three rounds of pretesting to ensure that each graphic resonated with the audience (Table 4-1). In Round I seven familiar *Food Friends®* characters and one new character were introduced to the children. Because of concern that superheroes would be more appealing to boys than girls, a Kruskal-Wallis ANOVA by rank test was used to analyze the character ranking data in Round I. Findings showed that no

differences existed by gender (Table 4-2). The characters, and group graphic, were very well accepted by preschoolers and teachers.

A key finding in Round I was that preschoolers could identify concrete activities in which equipment was used - tricycle, soccer ball, weights, jump rope, hoola hoop - more so than abstract activities, such as rolling, hugging, dancing. Originally, the research team did not want all graphics to include equipment, so that the message to a low-income audience would not suggest that one needed a lot of equipment to be active. However, after Round I of pretesting, it was clear that in order for children to identify activities, equipment or prompts were necessary. Further, children identified roller skating, scooters, gymnastics, basketball, and soccer as activities, in addition to those already depicted in some graphics, as activities they like to do.

In regard to the new *Food Friends*® character, 'Bonnie Bean', children had difficulty correctly identifying what she was doing as well as what kind of food she was. Further, the name Bonnie did not resonate with the children, so a second name, Bella, was tested in Round II. Additionally, slight modifications to the group graphic, namely changing cape colors, were done for Round II. Other than cape colors, no changes were made to the graphics of the *Food Friends*® dressed as superheroes.

In Round II the group graphic and was verified by teachers and children (Figure 1). Four *Food Friends*® graphics whose physical activity was correctly identified in Round I were not changed and these graphics were also verified. Also in Round II, slight enhancements were added to the one character who was hoola-hooping to illustrate the twisting action as well as musical notes to Bonnie/Bella Bean to help

illustrate that she was dancing. Major modifications were made to two other characters – Gertie Gouda and Ollie Orange. Because gymnastics was identified by children in Round I as an activity they participated in, Gertie was shown doing a cartwheel. This was still too abstract for most of the children. Ollie Orange was put on roller skates, unfortunately, he forgot his shorts, and children commented: “Why is Ollie roller skating naked?” (Table 4-3).

As for Bella/Bonnie Bean, the musical note addition made the graphic more concrete and most children could identify her activity as dancing. However, despite deepening the color of the bean, only 50 percent of children correctly identified her as a bean. Because of her red, kidney bean appearance, children thought she was a ‘dancing sausage,’ ‘weenie,’ or potato. Modifications for Round III included darkening her complexion to make her resemble more of a black bean. Lastly, 74 percent of children preferred the name Bella over Bonnie.

In addition to Bella’s makeover, new graphics for Ollie and Gertie were introduced in Round III. Shorts were added to Ollie and three different graphics were tested for Gertie: walking, balancing on a beam, and playing soccer. Although children could identify soccer correctly, walking was chosen as the graphic because it did not require equipment. Ollie’s graphic was verified as was Bella Bean. Seventy-five percent of children correctly identified her as a bean, while only 15 percent identified her as something other than a Bean. Ten percent of children shrugged their shoulders and did not answer.

### ***Teacher Group Discussions***

Two group discussions were conducted with teachers, one in a rural mountain community (n=5) and the other in an urban area (n=5). Teachers, all female, were of mixed age, ethnicity and had diverse teaching experience (Table 4-4). Discussion took place regarding program length, duration of lessons, ways to incorporate the program into the existing day, ideas for activities, lesson enhancing materials (e.g. flash cards vs. posters), preferred mode of program packaging (binder, booklet, box, etc), and training. Findings on these topics were consistent with findings from the formative evaluation stage of this project and further verified their inclusion in the marketing mix.

Several topics emerged which refined the existing strategy, two of which came to light when discussing the graphics. First, one teacher noticed in the Ollie Orange graphic that he was roller skating but did not have proper safety equipment (e.g. elbow pads). This led to a conversation regarding the importance of the *Mighty Moves™* program in reinforcing safety messages which are taught in other areas of the preschool curriculum.

Secondly, while teachers were supportive of the superhero theme, and felt that it would truly engage children's imaginations, they also felt strongly about having the program illustrate that superheroes have more than just extraordinary physical traits. Because children have been so drawn to the *Food Friends®* characters, teachers discussed the opportunity for the *Food Friends®* to show children how superheroes are also kind, empathetic, cooperative, and helpful. Thus, *Mighty Moves™* could assist preschoolers with character building.

Teachers were presented with the idea of having children go on imaginary journeys to music as well as imaginary trips to places in the community, such as the firehouse, farmers' market, circus, etc. Building on the conversation of character building, teachers expanded on the community trips by suggesting that children could help the community members (e.g. fireman) do their jobs. This would illustrate community building while also teaching children about different occupations and places, thus supporting topics already discussed during the preschool years.

To further support the importance of integrating multiple subjects, teachers discussed the difficulty of fitting everything into an already busy day. While excited about a new and innovative program, many teachers' were concerned about the time a physical activity program might take away from other academic areas which they were mandated to teach. Suggestions to alleviate or diminish this concern would be to incorporate school readiness skills into the program, tie lesson objectives to the Head Start Child Outcomes Framework, require little preparation on the teachers' part, and provide all necessary materials.<sup>9</sup> While many of these topics were brought up in formative research, the cost of conducting physical activity in the classroom setting was verified and strategies (promotion) for decreasing this cost were identified and expanded upon.

### ***Program Development***

Before program development could occur, the costs and benefits in the exchange of increasing physical activity in the preschool environment, for both children and teachers, needed to be clearly defined. From formative research and group discussions with teachers it became very clear that time, space and equipment were

costs associated with conducting structured physical activity in the classroom. To alleviate these costs, comprehensive lessons would be developed, which would include Head Start Child Outcomes and require little preparation time. Additionally, lessons and activities would be designed for small classroom spaces so that gymnasiums and playgrounds were not required. Lastly, all necessary materials for conducting the program would be provided and self-contained in a large rubber bin. Collectively, by addressing these three elements, it was posited that the costs of conducting physical activity in the classroom would be lessened.

For children, the cost of participating in physical activity may be that some children, particularly those who are shy, physically disabled, or overweight; feel uncomfortable and/or awkward in doing so. To lessen this cost, two strategies were developed. First, lessons needed to not only be developmentally appropriate, but also had to be staged so that all children could do initial daily activities. Activities would then progressively build on themselves, so more advanced students would not get bored, and those children, who may be lacking confidence, could still participate by engaging in the initial activity. Secondly, providing fun, exciting, and imaginary concepts and materials were determined to be age-appropriate benefits for engaging children in activity. Creative and innovative lessons and activities, it was posited, would capture children's attention and imagination, and thus lead to high interest and participation in the *Mighty Moves*<sup>™</sup> program.

Once the exchange theory and final marketing mix were determined, creative concepts were developed. The following are key components to the *Food Friends Get Movin' with Mighty Moves*<sup>™</sup> program:

- *Mighty Moves™ and Superpowers*

As illustrated in the graphics, each *Food Friends®* character participated in a different physical activity. These activities represented an individual or a category of gross motor skills; these skills were presented to children as *Mighty Moves™*. For example, Corrine Carrot was graphically shown with a hoola-hoop and her *Mighty Moves™* were stability skills, such as twisting and bending. In addition to having *Mighty Moves™*, each character was given a superpower. While Corrine has X-ray vision, Howie Hamburger can transform himself by using his lettuce as a parachute, his tomato as a surf board and his bun as a boat.

- *Healthadelphia™*

In order for children to use their *Mighty Moves™* and superpowers, and to build community awareness, an imaginary community was created.

Healthadelphia is where the *Food Friends®* reside and children 'go' to help their fellow community members. Each week in the program children are lead on an imaginary journey to a new community place to help out. They help Fireman Frank, Lucy the Librarian, and Cathy the Clown in their jobs.

- *Musical CD*

Because teachers identified music as a critical component to engage children in movement, a custom musical CD was developed. The CD consists of 17 tracks, including an original theme song, eight character introductions (30 seconds), and 8 instrumental tracks (3-3:30 minutes). The theme song was

designed to be used every day to help kids practice their *Mighty Moves*<sup>™</sup>. Each week a new character was introduced and this character led the children on a musical journey. Similar to the imaginary trips, journeys take kids to places throughout Healthadelphia<sup>™</sup> where they also learn about where food is grown, sold, and produced. For example, Ollie Orange and Chef Charlie lead the children in shaking like a milk shake, sizzling like bacon, and popping like toast out of a toaster. The musical journeys help to tie nutrition and activity concepts together.

While teachers expressed the desire to have the CD journeys narrated, the research team did not comply. It was decided that program concepts needed to be tested and accepted prior to narration due to high costs. Additionally, due to the high number of Spanish-speaking children, narration could pose language challenges.

- *Mighty Moves*<sup>™</sup> *Materials*

In addition to the musical CD, teachers were provided other supporting materials. A 260 page activity binder was provided to each teacher and teaching assistant outlining all lessons and activities. Polyspots (rubber mats), in 4 colors and imprinted with a Food Friend character, were used to assist teachers in spacing children out in the classroom as well as integrate colors and characters into lessons. Beanbags, kickballs, yarn balls, beach balls, scarves (caples), and ropes in multiple colors were also provided. A

storybook on animal movements was included. Lastly, a Bella Bean puppet was provided to complement the existing *Food Friends*® puppets.

- *Training*

A 3-hour teacher training was developed to be conducted prior to program implementation. Hands-on and participatory activities were designed to show teachers various ways of teaching motor skills as well as the *Mighty Moves*™ activities. Program concepts and materials were also explained.

### ***Teacher Pretesting***

Three early childhood specialists participated in providing program feedback. The three individuals varied in experience, specialization, and center type, thus providing three distinctly different perspectives. All felt the materials were appropriate as well as creative and engaging.

### **Discussion**

Social marketing is often described as a consumer-focused planning framework which positions the target audience at the center of data collection, program development and program delivery in an effort to change behavior.<sup>10, 11</sup> The consumer orientation element of the marketing framework places an emphasis on understanding the target audiences' behaviors, attitudes, values, practices, and beliefs.<sup>12</sup> In continually returning to teachers and children to get their reaction and point of view, the development of *Food Friends Get Movin' with Mighty Moves*™ maintained a consumer focus.

In addition to consumer orientation, other elements of the social marketing framework, particularly exchange theory, audience segmentation, competition, and “the marketing mix,” were addressed through the first four stages of social marketing process used in developing *Mighty Moves*<sup>™</sup>. Within these stages – initial planning, formative research, strategy development, and program development and pretesting – target audience input shaped and ultimately determined the *Mighty Moves*<sup>™</sup> marketing mix. Table 4-5 summarizes the development of each of the four P’s through the early stages of the social marketing process, and how each piece of the marketing mix was verified and refined with continuous target audience input. While Table 4-5 illustrates *Mighty Moves*<sup>™</sup> development as a linear process, it should be noted that it was more of a continuous and iterative process.

### ***Implications for Social Marketing***

The methodology and strategies used in the development of the *Food Friends Get Movin’* with *Mighty Moves*<sup>™</sup> program component of the *Food Friends*<sup>®</sup> social marketing campaign, can serve as examples for others working with similar audiences, topics, and issues. Moreover, the summary of the process used in the program’s development (Table 4-5), illustrates the use of various methodologies, with multiple audiences, in determining the appropriate product, place, price and promotion. Understanding the marketing mix for both preschool-aged children and teachers led to a more informed exchange model for these audiences.

Lastly, public health professionals should not underestimate what it means to the target audience to be a part of program development. At the conclusion of the *Mighty Moves*<sup>™</sup> training, one teacher commented: “I did one of the interviews and

was a part of the group discussion. Now seeing what you put together for the program, I feel like I was heard. There's a part of me in that binder. Thank you, that's really neat to see."

### **Conclusion**

Obesity rates among children continue to rise and the need for programs addressing the preschool audience is clear. Social marketing provides a framework in which obesity prevention efforts can be developed. The research presented here illustrates how social marketing concepts were used in a portion of program development. This has led to further program development, including utilization of the Social Learning Theory in the design of: classroom lessons and activities; the teacher training component; and process evaluation instruments. The later stages of social marketing – implementation and evaluation – followed as part of a randomized controlled trial.

**Table 4-1:** Demographics of children by pretesting round

Demographics	Round I (n=28)		Round II (n=20)		Round III (n=45)		Total (n=93)	
	n	%	n	%	n	%	n	%
<b>Age</b>	20		20		45		85	
3-year olds	4	20.0	1	5.0	3	6.7	8	9.4
4-year olds	11	55.0	10	50.0	16	35.6	37	43.5
5 year olds	5	25.0	9	45.0	26	57.8	40	47.1
<b>Gender</b>	28		20		44		92	
Male	14	50.0	7	35.0	18	40.9	39	42.4
Female	14	50.0	13	65.0	26	59.1	53	57.6
<b>Ethnicity</b>	28		19		44		91	
Asian	0	0.0	1	5.3	2	4.5	3	3.3
African American	2	7.1	2	10.5	2	4.5	6	6.6
Hispanic	23	82.1	5	26.3	21	47.7	49	53.8
White, non-Hispanic	3	10.7	11	57.9	19	43.2	33	36.3

\*Missing age data due to inability of child accurately report age.

**Table 4-2:** Gender Differences in Ranking of *Food Friends*® Characters with *Mighty Moves*™

Food Friend Character	Mean ± SD (n=28)	Mean Rank (± SD) by Gender		Chi Square*	P-value
		Male (n=14)	Female (n=14)		
Ollie Orange	3.61 ± 2.08	3.50 ± 1.87	3.71 ± 2.34	0.01	0.91
Marty Milk	4.04 ± 1.97	3.43 ± 1.91	4.64 ± 1.91	2.42	0.12
Bella Bean	4.43 ± 2.41	5.14 ± 2.45	3.71 ± 2.23	2.66	0.10
Corrine Carrot	4.46 ± 2.43	4.00 ± 2.45	4.93 ± 2.40	1.13	0.29
Gertie Gouda	4.68 ± 2.48	5.21 ± 2.16	4.14 ± 2.74	1.24	0.27
Howie Hamburger	4.71 ± 2.11	4.29 ± 2.37	5.14 ± 1.79	1.15	0.28
Tina Tortilla	4.93 ± 2.52	5.43 ± 2.21	4.43 ± 2.79	1.00	0.32
Rudy D. Radish	5.14 ± 2.22	5.00 ± 2.48	5.29 ± 2.02	0.01	0.91

Notes: A rank of 1= favorite character and 8=least favorite character; \* Kruskal-Wallis Rank Order; no significant ( $p \leq 0.05$ ) differences were found between males and females.

**Table 4-3:** Graphic Pretesting Progression of 2 Characters – Gertie Gouda and Ollie Orange






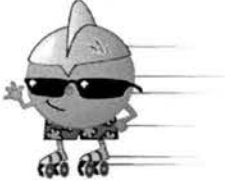


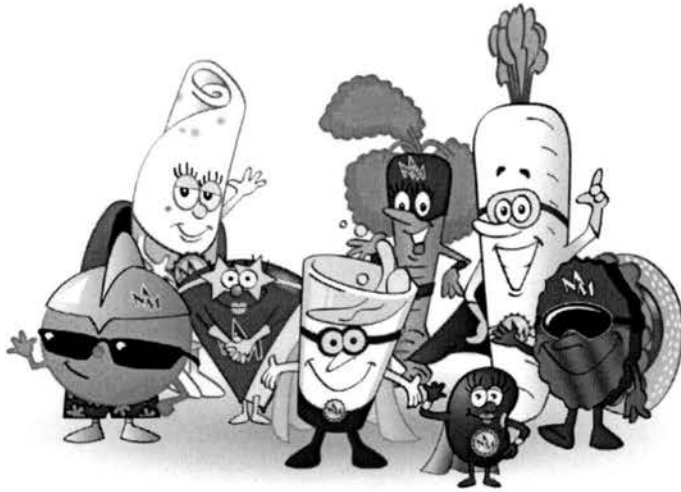
Graphic Version	Gertie Gouda		Ollie Orange	
	Graphic	Feedback	Graphic	Feedback
Round I		<i>Hugging/Self Love:</i> Children would hug themselves but could not verbalize what Gertie was doing; too abstract.		<i>Rolling:</i> Children could not verbalize what he was doing; too abstract
Round II		<i>Tumbling:</i> Children could not identify activity. They turned the paper around and asked "Why is she upside down?"		<i>Roller skating:</i> Children could identify activity but questioned: "Where are Ollie's shorts?" or "Why is he naked?"
Round III		<i>Walking and Balancing:</i> All children could identify walking/running. Many children identified the balancing as skateboarding or standing on the table: "My mom doesn't like it when I stand on the kitchen table." Most children correctly identified the soccer ball.		<i>Roller skating, shorts added:</i> Children verified that they could identify activity. Teachers asked that elbow pads be added to be consistent with safety messages.
Final Graphic		<i>Walking</i> was chosen as graphic		<i>Roller skating, elbow pads added</i>

Figure 1: *Food Friends Get Movin' with Mighty Moves™* Group Graphic



**Table 4-4:** Demographics of Teachers in Group Discussion

<b>Demographics</b>	<b>n=10</b>	<b>%</b>
<b>Age</b>		
18-34 years	3	30.0
35-44 years	2	20.0
45-59 years	5	50.0
>60 years	0	0.0
<b>Gender</b>		
Male	0	0.0
Female	10	100.0
<b>Ethnicity</b>		
Asian	0	0.0
African American	0	0.0
Hispanic	4	40.0
White, non-Hispanic	6	60.0
<b>Years Teaching Preschool</b>		
< 1 year	0	0.0
1-5 years	2	20.0
6-10 years	1	10.0
11-15 years	3	30.0
16-20 years	4	40.0
> 20 years	0	0.0

**Table 4-5:** Development of the Marketing Mix for *Mighty Moves*™ through multiple Social Marketing Stages

Marketing Mix	Social Marketing Stage			
	1: Initial Planning Outcomes (Literature Review)	2: Formative Research Outcomes (Teacher Interviews & Parent Focus Groups)	3: Strategy Development & Refinement Outcomes (Group Discussions & Graphic Pretesting)	4: Program Development Outcomes (Pretesting)
Product	Long Term: Decrease upward trajectory of weight gain in preschoolers	<i>Verified</i>	<i>Reaffirmed</i>	<i>Reaffirmed</i>
	Short Term: Enhance physical activity levels & motor skill development	<i>Verified</i>	<i>Reaffirmed</i>	<i>Reaffirmed</i>
Place	Head Start centers	<i>Verified</i>	<i>Reaffirmed</i>	<i>Reaffirmed</i>
Price		Discomfort: some children may feel uncomfortable moving in front of others (e.g. shy, disabled, overweight)	<i>Verified</i>	<i>Reaffirmed</i>
		Time (Teacher): Require little preparation for teacher friendly activities/lessons	<i>Verified</i>	<i>Reaffirmed</i>
		Space (Teacher): Design activities for small spaces	<i>Verified</i>	<i>Reaffirmed</i>
		Equipment (Teacher): Provide all necessary materials	<i>Verified</i>	<i>Reaffirmed</i>
() under social marketing stage indicate the methodology used to determine the marketing mix content. Note: Reading down illustrates the development of the Marketing Mix process by stage; reading across illustrates development of each Marketing Mix element.				

Table 4-5 continued

Marketing Mix	Social Marketing Stage			
	1: Initial Planning Outcomes (Literature Review)	2: Formative Research Outcomes (Teacher Interviews & Parent Focus Groups)	3: Strategy Development & Refinement Outcomes (Group Discussions & Graphic Pretesting)	4: Program Development Outcomes (Pretesting)
Promotion		Superhero theme	<i>Verified:</i> Superhero theme <i>Refinement:</i> In addition to physical attributes, reinforce character building - kindness, compassion, empathy, etc.	<i>Verified:</i> Community awareness and character building are taught and reinforced under the central superhero theme
		Utilize existing <i>Food Friends</i> ® characters	<i>Verified:</i> Use of <i>Food Friends</i> ® characters <i>Refinement:</i> Depict characters as superheroes engaging in activities that children can identify	<i>Verified:</i> Each character specializes in a <i>Mighty Move</i> , a single or group of motor skills, and a superpower
		Engage children's imaginations & promote dramatic play	<i>Verified:</i> Promote dramatic play & engage imaginations <i>Refinement:</i> <i>Food Friends</i> ® characters will lead children in imaginary musical journeys and trips throughout the "community"	<i>Verified:</i> Children develop their <i>Mighty Moves</i> ™ and superpowers to assist the <i>Food Friends</i> ® in helping people in the town of <i>Healthadelphia</i> ™ through musical journeys and imaginary trips
		Design developmentally- & age-appropriate lessons to reinforce school readiness skills.	<i>Verified:</i> Reinforce school readiness skills in lessons <i>Refinement:</i> Lessons should be tied to Head Start Child Outcomes Framework.	<i>Verified</i>
<p>( ) under social marketing stage indicate the methodology used to determine the marketing mix content. Note: Reading down illustrates the development of the Marketing Mix process by stage; reading across illustrates development of each Marketing Mix element.</p>				

**Table 4-5 (continued)**

Marketing Mix	Social Marketing Stage			
	1: Initial Planning Outcomes (Literature Review)	2: Formative Research Outcomes (Teacher Interviews & Parent Focus Groups)	3: Strategy Development & Refinement Outcomes (Group Discussions & Graphic Pretesting)	4: Program Development Outcomes (Pretesting)
Promotion (con't)		Package & brand materials in self-contained large bin	<i>Verified</i>	<i>Reaffirmed</i>
		Provide hands-on training for teachers	<i>Verified</i>	<i>Reaffirmed</i>
<p>( ) under social marketing stage indicate the methodology used to determine the marketing mix content. Note: Reading down illustrates the development of the Marketing Mix process by stage; reading across illustrates development of each Marketing Mix element.</p>				

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## CHAPTER 5

### DEVELOPMENT OF A PHYSICAL ACTIVITY PROGRAM UTILIZING THE SOCIAL LEARNING THEORY

#### **Abstract**

#### ***Objectives***

To utilize the Social Learning Theory in the development of program materials and process evaluation instruments for a physical activity program for preschoolers.

#### ***Methods***

An 18 week activity program was developed and tested in 4 experimental Head Start Centers. Process evaluation instruments were completed by teachers and included three surveys and direct observation.

#### ***Results***

Questions and data were grouped by theory construct and analyzed. Strong associations in self-efficacy and behavioral capability were found. Teacher characteristics were associated with program activity rankings and self-efficacy.

#### ***Conclusions***

The *Mighty Moves*<sup>™</sup> program was well accepted by teachers and children.

## Introduction

The establishment of healthful habits in the early years, such as good nutrition and adequate physical activity, are important to the prevention of childhood overweight. Healthful behaviors are fostered by stimulating and encouraging environments in which children live and play, including preschool and Head Start centers.

Unfortunately, obesity prevention efforts in the preschool and child care environment are lacking.<sup>1</sup> *Food Friends- Making New Foods Fun for Kids*® is a social marketing campaign that has successfully demonstrated changes in preschool children's willingness to try new foods.<sup>2-4</sup> The addition of physical activity component, *Food Friends Get Movin' with Mighty Moves*™, to the larger *Food Friends*® social marketing campaign aims to curb the rise in childhood overweight in the preschool audience. To enhance the likelihood of changing the desired behaviors targeted by *Mighty Moves*™ - increasing physical activity, physical fitness, and enhancing gross motor skill development - the Social Learning Theory was applied, within the social marketing framework, to the development, implementation, and process evaluation of the program.

Behavioral change theories and social marketing strategies have been independently applied to numerous nutrition and health-related interventions with positive results. However, few published social marketing articles describe behavioral theory as part of the development of social marketing programs. The integration of behavior change theory and social marketing strategies has great potential to effectively facilitate the bottom-up development, implementation, and evaluation of theory-driven, health-related educational and behavioral-change

program. Theory indicates what needs to be done to change behavior and social marketing provides direction for how to change the behavior.<sup>5</sup>

Social marketing is an audience-focused, research-based process to plan, develop, implement, and evaluate programs that are designed to influence behavior of the target audience, in an effort to improve their well-being and/or that of the society of which they are a part.<sup>6</sup> The social marketing process is a continuous, iterative process described by Grier and Bryant as consisting of six major steps or tasks: initial planning; formative research; strategy development; program development and pretesting; implementation; and monitoring and evaluation.<sup>7</sup>

The Social Learning Theory, also referred to as the Social Cognitive Theory, addresses cognitive, emotional, and behavioral factors that underlie health behavior and the methods of promoting behavior change.<sup>8</sup> Bandura proposes that behavior can be explained and predicted through understanding the dynamic, three-way interaction between behavior, personal factors, and environmental factors known as reciprocal determinism.<sup>9</sup>

Social marketing can be viewed as a planning framework that incorporates behavior change theory within the context of consumer orientation. The synergistic value of overlaying theory into social marketing efforts will allow health educators to better identify consumer values, and hence better reach the target audience.<sup>5</sup>

Formative research as well as strategy development and concept refinement for the *Food Friends Get Movin' with Mighty Moves™* physical activity program were

conducted and are reported elsewhere.<sup>10,11</sup> This paper outlines the application of the Social Learning Theory to the *Mighty Moves*<sup>™</sup> physical activity component in the latter three steps of the social marketing framework - program development, implementation and process evaluation. Further, teacher feedback to program implementation, including input on lessons and materials and self-efficacy in conducting the program, is presented. This research was approved by the Human Subjects Committee at Colorado State University.

## **Methods**

### ***Program Development***

#### *Classroom Lessons and Materials*

Based on formative research with various target audiences – preschool-aged children, teachers, and parents – and input from the research team (experts in the fields of exercise science, physical education, occupational therapy, public health, and nutrition), it was determined that *Mighty Moves*<sup>™</sup> program development would focus on the three distinct areas: gross motor skill development, creative themes and concepts, and application of the Social Learning Theory.

Lessons would focus on the development of gross motor skills – stability, locomotor, and manipulative skills- as well as enhancing the opportunities for physical activity in the preschool classroom environment. Also, lessons would be composed of several short activities in consideration of young children’s attention spans and allow for introduction of new motor skills, repetition and practice of ‘old’ motor skills, and exploration of movement concepts (e.g. pathways, levels, or force). Further, the

*Food Friends*® characters (e.g. Gertie Gouda, Howie Hamburger, and Tina Tortilla) would conceptually and illustratively promote a superhero theme throughout the program's lessons and materials. Lastly, the constructs of the Social Learning Theory would be applied throughout the development of lessons and supporting materials.

### *Lesson Pretesting*

Preschool and/or Head Start teachers were invited to review program lessons at two points during program development: time 1 (Weeks 1-9) and time 2 (Weeks 10-15). Lessons for weeks 16-18 were developed after the first nine weeks of the program were conducted in the Head Start centers, so that feedback from teachers implementing the program could be included. At each point, teachers were mailed a packet containing the program background and concepts, *Food Friends*® superhero graphics, and a list of questions to consider. Questions for teachers to consider included: age- and developmental appropriateness of lessons; lesson layout, content and themes; duration and frequency of lessons; and comments on the program and lessons in general. Teachers were asked to write or type their comments and return their comments and notes to the research team within a two week time frame. Teachers were compensated \$40 for their time for each review.

### *Teacher Training*

Based on findings from the formative research and strategy development phases of this study, teachers emphasized a strong desire for hands-on training with demonstration and participation.<sup>10</sup> Training materials would be developed to cover program concepts, lessons, instructions on how to implement the program, as well

as information on the study's data collection methodology. Social Learning Theory constructs were applied to the training content and materials.

### ***Implementation***

*Mighty Moves*<sup>™</sup> was implemented as part of a randomized controlled trial in which 4 Head Start centers (24 classrooms) were randomly assigned to the experimental group and 4 Head Start centers (11 classrooms) to the control group. Prior to program implementation in the classroom, teachers and teacher assistants in the experimental classrooms were required to attend a three hour hands-on training. Control group teachers attended a 1-hour training which covered only information pertaining to the study and data collection methodology.

### ***Process Evaluation***

Four process evaluation instruments were developed based on the constructs of the Social Learning Theory: a teacher training survey, *Mighty Moves*<sup>™</sup> program surveys, a direct observation rating scale, and a final teacher survey. These instruments were tested for face and content validity by the research team to ensure acceptability and understandability of the questions and rating scale. Table 5-1 summarizes how theory constructs were applied and which instruments addressed each construct. Further, these process evaluation measures were only conducted with teachers in the experimental classrooms.

#### ***Teacher Training Survey***

This survey was administered at the conclusion of the teacher training session. It included six questions – 4 closed ended and 2 opened questions: a retrospective

pre-post question assessing self-efficacy of teaching physical activity in the classroom, confidence about teaching *Mighty Moves*<sup>™</sup> in the classroom, adequacy of the amount of training provided, and what they liked best and least about the training. Demographic information was also obtained.

#### *Mighty Moves*<sup>™</sup> program surveys

A program survey was administered every three weeks to ascertain teachers' impressions on individual lessons and activities, ease/difficulty of conducting activities, clarity of instructions, children's interest in the program, children's participation in the program, teachers' self-confidence in teaching program lessons and activities. These variables were measured using a 5-point Likert scale, with 5 being the most positive response and 1 being the most negative response. Six surveys were conducted over the 18-week study period. Each survey was one page front and back and embedded within the *Mighty Moves*<sup>™</sup> Program Activity Binder provided at the training session. Reminders to complete the survey were strategically placed in the activity binder to assist teachers in returning surveys promptly. Teachers were provided with pre-addressed manila envelopes for returning the surveys. Those teachers who returned the survey by a given date were entered into a drawing for a cash prize.

#### *Direct observation rating scale*

A member of the research team visited each of the four experimental Head Start centers at the mid-point of the study to observe teachers conducting *Mighty Moves*<sup>™</sup> lessons and to assess study fidelity. Notes were taken on each observation and a 5-point Likert scale was developed post hoc to categorically assess teachers'

implementation of the program. Scoring assessed lesson preparation, presentation, and classroom adaptation. A score of 5 indicated that the teacher conducted *Mighty Moves*™ as planned, with appropriate adaptation for the class, and preparation was apparent. Conversely, a score of 1 indicated that the teacher conducted *Mighty Moves*™ verbatim from the activity binder, read the lesson in monotone, had no interaction with the children, and it was evident that little or no preparation had occurred.

#### *Final study survey*

At the conclusion of the study, teachers were asked to complete a final survey which, in part, assessed usefulness of program materials, adequacy of teacher training, length of program, and preferred time of year for implementation. Survey questions were a mix of open and closed-ended questions. For example, usefulness of individual materials was assessed on a 5-point Likert scale, with 5 being very useful and 1 being not useful. This question was followed up by an open-ended question ascertaining if other materials should be added to the program. Demographic information was also obtained.

#### *Statistical Analysis*

Upon completion, select questions from the four instruments were grouped by the main Social Learning Theory construct which they represented. Data were then analyzed using the Statistical Package for Social Science (SPSS 15.0 Windows; SPSS, Inc., Chicago, IL) program. Descriptive statistics (percentage, mean, standard deviation) were obtained for all variables. Chronbach's alpha was used to assess internal consistency among questions within each construct. Constructs with

a Chronbach's alpha of 0.70 and above were considered acceptable. Association between two questions within constructs was determined by Kendall's tau-b coefficient. The Wilcoxon signed-rank test was used to assess changes in teachers' self-efficacy. Lastly, Kendall's tau-b coefficient analyzed associations among teacher demographics and select questions from the process evaluations.

## **Results**

### ***Program Development***

#### *Classroom Lessons and Materials*

*Food Friends Get Movin' with Mighty Moves™* physical activity component is 18 weeks in length and conducted in the classroom 4 days a week for 15-20 minutes each day, for a total of 72 lessons. Gross motor skill development, integration of creative concepts, and application of the Social Learning Theory were key strategies in the program development process.

#### Gross Motor Skill Development

A matrix outlining gross motor skill progression and movement concepts (e.g. space awareness, effort, and relationships) over an 18-week time frame was developed. Each week focused on a skill or group of skills from one of the three gross motor skill categories: stability, locomotor, or manipulative. Early in each week, children were introduced to a motor skill with movement concepts added as the week progressed. Later in the program, skill patterns, a combination of more than one motor skill, were incorporated into activities.

Creative themes and concepts

Creatively, a superhero theme was integrated into the motor skill progression matrix, described above. Graphics depicting each of the *Food Friends*® characters participating in different physical activities were developed. [SMQ] These activities represented different motor skills, which were presented to children as *Mighty Moves*™. In addition to having a *Mighty Move*, each character also had a superpower. For example, Tina Tortilla's *Mighty Moves*™ were jumping, leaping, and hopping. Her superpower, flying, allowed her to fly over the town of Healthadelphia™, where the *Food Friends*® introduced children to people within the community, such as Patti the Policewoman and Luis the Lifeguard.

Over the course of the program, characters were used to introduce gross motor skills and movement concepts. During the first half of the program, each character 'hosted' a week worth of activities focusing on their *Mighty Moves*™ (gross motor skills). At mid-point, children participated in the *Mighty Moves*™ capping ceremony. During the ceremony, children demonstrated their *Mighty Moves*™ and pledged to continue to practice them. They were then given a cape to symbolize their newly acquired superpowers. During the second half of the program, each character again "hosted" a week of activities in which children used both their *Mighty Moves*™ and superpowers to help the *Food Friends*®.

Application of the Social Learning Theory

Seventy-two lessons were developed for the 18 week program. Each lesson had multiple activities; within the 72 lessons were 184 activities. Lessons were tied to

the Head Start Child Outcome Framework. Additionally, each lesson outlined the *Mighty Moves*<sup>™</sup> materials required for the lesson; simple instructions for the teacher, including preparation tasks; and narrative for teachers to use with the children.

Materials supporting the lessons, as well as creative themes and concepts, were provided for each classroom in a large, self-containing bin and included: a custom musical CD (17 tracks) with a theme song, character introductions, and instrumental music tracks; twenty polypots (rubber mats) of various colors and with a *Food Friends*<sup>®</sup> character imprinted on each polypot; a set of 9 large flashcards introducing the characters, their *Mighty Moves*<sup>™</sup> and superpowers; a Bella Bean puppet to complement existing *Food Friends*<sup>®</sup> puppets; twenty multi-colored scarves/capes; various multi-colored sized balls – beach balls (20), fleece balls (6), kickballs (6); twenty multicolored beanbags; a storybook illustrating different animal movements, three ropes of different lengths; and parent materials (described elsewhere).

Collectively, *Mighty Moves*<sup>™</sup> lessons and materials were designed to increase physical activity levels, improve physical fitness, and enhance gross motor skill development. To enhance the likelihood that these behavior changes would occur, the following constructs of the Social Learning Theory were applied:

- Reciprocal Determinism

*Mighty Moves*<sup>™</sup> was designed to facilitate an interaction among children, children's level of physical activity and motor development, and the environment in which children are active. Children were provided with materials, time and opportunities within the classroom to participate in daily

physical activity which taught, reinforced, and built motor skills. Classrooms provided safe and supportive physical and social environments for movement exploration during structured and unstructured free/play time.

- Behavioral Capability

*Mighty Moves*<sup>™</sup> included developmentally appropriate and culturally sensitive materials and activities for children. Activities engaged children with music and dance while promoting the development of gross motor skills. Initial activities taught specific motor skills with subsequent activities building on those skills. Activities were designed so all children, regardless of physical ability, could participate at their appropriate level. Multiple quantities of materials (e.g. beanbags, scarves, polypots) were provided to eliminate the need for sharing, allowing for more time for skill development.

- Reinforcement

Activities were built on each other, thus reinforcing specific motor skills throughout the 18-week program. *Mighty Moves*<sup>™</sup> (gross motor skills) and superpowers were reinforced through daily activities, and in various aspects of the classroom. Materials with *Food Friends*<sup>®</sup> characters imprinted on them also reinforced program messages and concepts.

- Self Efficacy

Initial activities in the program began with movements that most children could do. Progression of motor skill development through activities allowed adequate time for children to master the skills, and thus develop self-efficacy in the various movements. Furthermore, repetition of the activities was encouraged so skill mastery could be achieved.

- Observational Learning

Children learned activities and movements by watching adults and peers role model them.

- Expectations and Expectancies

Because *Mighty Moves*™ was built on the existing *Food Friends*® program, it was vital for program components to resonate with the target audience in a similar way to *Food Friends*®. Characters continued to promote fun and engaging activities for children.

Once drafted, the research team reviewed the lessons for content, theory application, and creative consistency. Lessons were next pretested with early childhood specialists.

### *Lesson Pretesting*

Three early childhood specialists participated in providing program feedback. The three individuals varied in experience, specialization, and center type, thus providing three distinctly different perspectives. Lessons and activities were found to be acceptable, as well as creative and engaging. Suggestions for slight modifications to make them more age-appropriate were provided.

### *Teacher Training*

Teacher training handouts were developed and included as the first section of the *Mighty Moves*™ Activity Binder. Handouts covered program details and concepts,

information on motor skill development, and the study timeline and instruments.

Further, activities for the training were designed to engage teachers in movement and demonstrate how lessons were built and should be performed in the classroom.

Application of the Social Learning Theory to the teacher training includes:

- Reciprocal Determinism

For *Mighty Moves*™ to be successful with children, teachers, as gatekeepers, needed to be trained. Teachers influence the physical environment by establishing and repeatedly offering structured activity during the school day with age- and developmentally appropriate activities and materials. Teachers influence the social environment by modeling physical activity movements, encouraging children to be active during unstructured free/play time, assisting children with gross motor skill development. Teachers' knowledge and skill development in teaching gross motor skill development and leading physical activity, through training, allows for appropriate program implementation and desired behavioral improvements in children.

- Behavioral Capability

The teacher training covered age appropriate motor skills for preschoolers as well as teaching cues for these skills. The *Mighty Moves*™ program was designed to include all necessary information, materials and equipment. The adequacy of program presentation - objectives, directions, and activity outlines - would enhance teachers' ability to conduct the program in the classroom. Research staff provided technical assistance, as needed.

- Reinforcement

Research staff provided reinforcement through site visits and phone calls. Teachers were provided with pedometers in an effort to enhance their own physical activity levels and to, possibly, empower them to serve as positive role models.

- Self Efficacy

Teacher training used demonstration, role playing, and hands-on instruction to enhance teachers' confidence and self-efficacy. Peer support and modeling was encouraged throughout the 18 weeks.

- Observational Learning

Teachers learned how to conduct activities by observing a trainer(s) and peers prior to classroom implementation. Teachers were encouraged to use similar strategies while conducting the program in the classroom.

- Expectations and Expectancies

Teachers appreciate the minimal preparation time that the *Food Friends*® program entails, therefore, *Mighty Moves*™ also required minimal preparation. All equipment and necessary materials were supplied.

Teachers would expect the program to engage children's interest and, hence, lead to high participation.

Upon completion of the training, teachers were provided with their *Mighty Moves*™ materials and encouraged to explore and become familiar with the lessons in the activity binder and materials prior to the start of program implementation.

### ***Implementation***

A three-hour teacher training was conducted five times at the four experimental sites and a one-hour training was conducted five times with control site teachers. Thirty-eight and 21 teachers participated in experimental and control trainings, respectively. Twenty-four bins, or sets, of *Mighty Moves*<sup>™</sup> materials were distributed to the 24 experimental classrooms.

### ***Process Evaluation***

Teachers and teacher assistants in the experimental group were asked to complete one teacher training survey (n=36), six *Mighty Moves*<sup>™</sup> program surveys (n=44), and a final survey (n=34). Additionally, thirty-six teachers were directly observed teaching *Mighty Moves*<sup>™</sup> in their classroom. All teachers were female, and were of mixed age, ethnicity and had diverse teaching experience (Table 5-2).

Overall the *Mighty Moves*<sup>™</sup> program was well accepted among teachers with high average rankings for activities (mean=4.00, SD=.94) and materials (mean=4.27, SD=.56). Table 5-3 illustrates how select questions were grouped into Social Learning Theory constructs. Internal consistency greater than 0.70 among groupings was found within four of the six constructs (behavioral capability, reinforcement, self-efficacy and expectations/expectancies) ranging between 0.723-0.973. Several strong associations between questions within constructs were found, including all questions within the behavioral capability and expectations and expectancies constructs.

Changes within self-efficacy (Table 5-4) were demonstrated at different points in program implementation. The *Mighty Moves*<sup>™</sup> training produced a significant increase in confidence of teaching physical activity from pre- to post-training. Unfortunately, comparing self-confidence in teaching *Mighty Moves*<sup>™</sup> post-training to confidence throughout implementation was significantly lower. No significance was found between pre-training and implementation, indicating that confidence returned to pre-training levels.

While teacher confidence decreased throughout program implementation, when asked during training if the amount of training was adequate 87% (n=38) of teachers responded that the amount was just right, while 10% (n=4) thought the amount was okay but would have liked more, and 3% (n=1) did not feel that the training was necessary. Similar results were found when the question was asked at the conclusion of the program on the Final Survey.

In an effort to understand difference between teacher rankings, the Kendall's tau-b coefficient analyzed associations between teacher demographics and their mean ranking of *Mighty Moves*<sup>™</sup> activities as well as their confidence (Table 5-5). Teachers with a higher Body Mass Index (BMI), more education, had older students, and of Hispanic ethnicity, ranked program activities higher and had more confidence. No association was found between age and teaching experience with *Mighty Moves*<sup>™</sup> activity rankings and teacher confidence.

## Discussion

Previous research has emphasized that the most effective health programs are those that are behaviorally focused and based on appropriate theory.<sup>12</sup> Theoretically based behavioral interventions have demonstrated effectiveness in increasing physical activity and improving nutrition in order to prevent chronic disease.<sup>13</sup> For theory-based physical activity interventions, strategies are often developed to impact constructs posited to be mediators of behavior change.<sup>14</sup> However, little work has been done to assess and understand the moderators and mediators of behavior change so that psychometric properties of these interventions can be improved to enhance the programs' overall effectiveness.<sup>13, 14</sup>

This study utilized the constructs Social Learning Theory in the development of the classroom, teacher training, and process evaluation components of the *Food Friends Get Movin' with Mighty Moves™* program. By examining the process evaluation results within theory constructs, potential mediators could be examined.

Training on physical activity and gross motor skill development was identified by teachers as a critical component to program development.<sup>10</sup> As such, it was posited that the training was essential, not only for program fidelity, but for building teacher confidence in teaching physical activity and *Mighty Moves™* in their classroom. For many, the *Mighty Moves™* training was the first such training opportunity covering these topics. Process evaluation demonstrated that while self-efficacy increased immediately after the training, it was not sustained throughout implementation of *Mighty Moves™*, suggesting that additional training sessions may need to be added to the program.

The environment for conducting physical activity differs tremendously between preschool centers and classrooms. Dowda et al. found the quality and quantity of physical activity in child care settings can vary depending on indoor space, gross motor play equipment, outdoor play area, group size and the education or training of child care staff.<sup>15</sup> This study did not focus on the physical child care environment per se, but rather the personal characteristics of teachers which can be contributors to the classroom environment. While other studies implementing physical activity programs in the preschool-environment have used specially trained teachers to conduct lessons and activities rather than the classroom teacher, the *Mighty Moves™* program looked at classroom teachers as a critical component for generalizability and future sustainability of the program, thus they were an integral part of program development.<sup>16, 17</sup> Results reported here illustrate associations between personal characteristics of teachers – BMI, ethnicity, education, and age of children in the classroom - and program rankings and teacher confidence. Further examination of other teacher attributes and how they may effect physical activity in the classroom is warranted.

Teacher characteristics and self-efficacy, along with other constructs of the Social Learning Theory, are potential mediators of the desired behavior changes in young children. Future work with *Food Friends Get Movin with Mighty Moves™* will examine the psychometric properties of both preschool-aged children and teachers and how they relate to physical activity and gross motor skill outcomes.

Understanding the mediators to these behavior changes may help to improve the overall effectiveness of the *Mighty Moves™* program.

## **Conclusion**

Using behavior change theory within the social marketing framework allows for the consumer, or target audiences, to be at the center of program development.

Integrating behavior change theories into social marketing efforts aides in identifying which behavioral constructs to address and can impact the choice of behavioral, environmental or policy targets for the intervention. By utilizing the Social Learning Theory in the development and process evaluation of *Food Friends Get Movin' with Mighty Moves™*, a more comprehensive view of children and teachers' behavioral capabilities, self-efficacy, expectations and expectancies, and the interplay between their individual characteristics, environment, and behavior was obtained.

Understanding the interaction of these constructs and their role as moderators and mediators will assist in interpreting program outcomes.

**Table 5-1:** Application of Social Learning Constructs to Process Evaluation Instruments

<b>Social Learning Theory Construct</b>	<b>Application to Process Evaluation Instruments</b>	<b><i>Mighty Moves</i><sup>TM</sup> Process Evaluation Instrument(s)</b>
Reciprocal Determinism	Assess teachers' attitudes and behaviors related to conducting the program in the classroom environment	<i>Mighty Moves</i> <sup>TM</sup> Program Surveys Observation
Behavioral Capability	Assess teachers' perceptions of ease/difficulty of activities and their directions	<i>Mighty Moves</i> <sup>TM</sup> Program Surveys Final Survey
Reinforcement	Assess adequacy of provided materials	Final Survey
Self Efficacy	Assess confidence and ability to conduct program activities as planned	Teacher Training Survey <i>Mighty Moves</i> <sup>TM</sup> Program Surveys
Observational Learning	Assess strategies used to demonstrate program concepts	Final Survey
Expectations and Expectancies	Assess teachers' perceived interest and participation of children in the <i>Mighty Moves</i> <sup>TM</sup> program	<i>Mighty Moves</i> <sup>TM</sup> Program Surveys

**Table 5-2: Teacher Demographics (Experimental Group)**

<b>Demographics</b>	<b>N</b>	<b>%</b>
<b>Teaching Position<sup>††</sup></b>	45	
Teacher	24	52.2
Teacher Assistant	21	45.7
<b>Age<sup>*†</sup></b>	40	
Under 25 years	3	7.5
25-34 years	12	30.0
35-44 years	8	20.0
45-54 years	12	30.0
55-64 years	4	10.0
>65 years	1	2.5
<b>Gender<sup>††</sup></b>	45	
Male	0	0.0
Female	45	100.0
<b>Ethnicity<sup>††</sup></b>	40	
Hispanic	28	70.0
White, non-Hispanic	9	22.5
Other	3	7.5
<b>Education<sup>†</sup></b>	34	
High School diploma or GED	3	8.8
Some College	10	29.4
Associate's Degree	17	50.0
Bachelor's Degree	3	8.8
Advanced Degree (Masters, Doctorate)	1	2.9
<b>Years Teaching Preschool<sup>†</sup></b>	33	
< 5 years	10	30.3
5-10 years	9	27.3
11-15 years	3	9.1
16-20 years	8	24.2
> 20 years	3	9.1
<b>Age of Students in Classroom<sup>†</sup></b>	34	
3 year olds	1	2.9
4 year olds	7	20.6
Mixed 3,4,5 year olds	22	64.7
5 year olds	4	11.8
<b>Body Mass Index<sup>†</sup></b>	34	
Normal Weight (18.5-24.9)	15	44.1
Overweight (25.0-29.9)	5	14.7
Obese ( $\geq$ 30.0)	14	41.2

\* Teacher Training Survey

† Final Survey

**Table 5-3:** Select Process Evaluation Questions Grouped by Social Learning Theory Construct

Select Questions (instrument)	Anchors	n	Mean ± SD	Chr α	Kendall tau-b
<b>Reciprocal Determinism</b>				<b>0.464</b>	
Please check the box that best describes what you think about each activity component (n=184). (PS)	1=Poor; 5=Great	44	4.00 ± .56		
How well was MM conducted in the classroom? (DO)	1=Poor; 5=Great	36	3.86 ± .19		
<b>Behavioral Capability</b>				<b>0.973</b>	
Do you feel the activities are ___ to do with the kids? (PS)	1=Hard; 5=Easy	43	3.77 ± .99		a*,b*,c*
Do you feel the activities are _____? (PS)	1=Common & boring; 5=Unique & exciting	43	3.62 ± .94		a*,d*,e*
Are the activity directions _____ to follow? (PS)	1=Very difficult; 5=Very easy	43	3.67 ± 1.01		b*,d*,f*
Are the activity directions _____ to understand? (PS)	1=Very hard to understand; 5=Very understandable	43	3.72 ± .97		c*,e*,f*
<b>Reinforcement</b>				<b>0.893</b>	
How useful were each of the following materials in teaching the MM program? (FS)	1=Not useful; 5=Very useful				N/A
-Activity Binder		34	4.53 ± .66		
-Musical CD		34	4.50 ± .71		
- <i>Mighty Moves</i> ™ Certificate		34	4.47 ± .71		
-Polyspots (rubber mats)		33	4.42 ± .87		
-Beanbags		34	4.41 ± .74		
-Bella Bean Puppet		34	4.38 ± .78		
-Fleece balls		34	4.38 ± .82		
-Kickballs		34	4.29 ± .80		
-Scarves		34	4.26 ± .79		
-Beach balls		34	4.18 ± .94		
-Storybook: Move		33	3.97 ± .88		
-Flashcards		33	3.91 ± .10		
-Rope		34	3.85 ± .11		
Average <i>Mighty Moves</i> ™ Materials		34	4.27 ± .56		

Notes: Chr α = Chronbach's alpha; PS=Program Survey; DO=Direct Observation; TTS=Teacher Training Survey; FS=Final Survey  
 Similar letters within construct are significantly associated: \*p<0.001, † p<0.05,

**Table 5-3** continued

Select Questions (instrument)	Anchors	n	Mean ± SD	Chr $\alpha$	Kendall tau-b
<b>Self Efficacy</b>				<b>0.723</b>	
Prior to this training, I felt confident that I can teach Physical Activity in my classroom. (TTS)	1=Not confident; 5=Very confident	36	3.75 ± .94		a*,b <sup>†</sup>
After this training, I feel confident that I can teach Physical Activity in my classroom. (TTS)	1=Not confident; 5=Very confident	36	4.58 ± .50		a*,c*
I am confident I can conduct MM in my classroom. (TTS)	1=Not confident; 5=Very confident	36	4.44 ± .56		b <sup>†</sup> , c*
How do you feel when teaching the activities to the children? (PS)	1=Very unconfident; 5=Very confident	44	3.91 ± .84		
<b>Observational Learning</b>				<b>0.146</b>	
When teaching MM in your classroom, how often did you use the following strategies: (FS)	1=Never; 5=Always				
-Adult role modeling		34	4.59 ± .82		
-Peer role modeling		34	3.79 ± .91		
<b>Expectations and Expectancies</b>				<b>0.971</b>	
How would you describe the children's overall interest in and excitement about MM? (PS)	1=Very low; 5=Very high	44	4.02 ± .76		a*
The children's overall participation in the program is: (PS)	1=Very low; 5=Very high	44	3.96 ± .75		a*

Notes: Chr  $\alpha$  = Chronbach's alpha; PS=Program Survey; DO=Direct Observation; TTS=Teacher Training Survey; FS=Final Survey  
 Similar letters within construct are significantly associated: \*p $\leq$ 0.001, † p $\leq$ 0.05,

**Table 5-4:** Changes in Teacher Self-Efficacy from Pre-Training

Time Point	Self-Efficacy Measure*	Mean $\pm$ SD	P-value**
<b>Teacher Training Survey (n=34)</b>			
Pre-training	Prior to this training, I felt confident that I can teach physical activity in my classroom.	3.72 $\pm$ 0.92	
Post-training	After this training, I feel confident that I can teach physical activity in my classroom.	4.56 $\pm$ 0.50	<0.001
Post-training	I am confident that I can conduct Mighty Moves in my classroom.	4.41 $\pm$ 0.55	<0.001
<b>Mighty Moves Program Survey (n=32)</b>			
Implementation (Average over 18 weeks)	How do you feel when teaching the [Mighty Moves] activities to the children?	3.79 $\pm$ 0.84	0.10
Implementation (Post-18 weeks)	How do you feel when teaching the [Mighty Moves] activities to the children?	3.67 $\pm$ 0.82	0.58

\*Anchors: 1= Not Confident; 5= Very Confident

\*\*Statistical Test: Wilcoxon Signed Ranks Test

**Table 5-5:** Association of Teacher Demographics with Mean Activity Ranking and Confidence

Demographic	<i>Mighty Moves</i> <sup>TM</sup> Activity Ranking		Teacher Confidence	
	Value	P-value	Value	P-value
Age	-0.095	0.52	-0.095	0.51
Education	0.217	0.09	0.259	0.05 <sup>†</sup>
Ethnicity	-3.920	0.002 <sup>†</sup>	-0.315	0.02 <sup>†</sup>
Years Teaching Preschool	0.118	0.50	0.090	0.58
Age of Children in Classroom	0.310	0.06	0.358	0.04 <sup>†</sup>
BMI	0.349	0.03 <sup>†</sup>	0.283	0.06

Kendall tau-b coefficient - Significance levels: † p<0.05

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## CHAPTER 6

### **Relationships between Physical Activity, Physical Fitness, and Gross Motor Skills in Preschoolers: Baseline Data for the *Food Friends Get Movin' with Mighty Moves*<sup>™</sup> Study**

#### **Abstract**

This study reports participant characteristics as well as anthropometric, physical fitness, gross motor skills, and physical activity baseline data for 267 preschoolers participating in the *Food Friends Get Movin' with Mighty Moves*<sup>™</sup> randomized controlled trial. Pedometers were used to assess physical activity levels in preschool-aged children and a mean ( $\pm$  SD) daily step count of  $9,509 \pm 3,599$  was found. Several significant, but weak, associations were found between weight status, physical fitness, gross motor skills, and physical activity. Characteristics of the study population indicate a high prevalence of overweight, low physical activity levels, and average to below-average motor skills.

#### **Introduction**

Declining levels of physical activity may be responsible for rising childhood obesity rates. Research shows that lower levels of physical activity and habitual exercise among children are associated with higher Body Mass Index (BMI), greater skinfold thickness, greater fat mass, and obese status. Similarly, lower levels of fitness have been associated with an increased likelihood of being overweight.<sup>1</sup> Studies involving

preschool-aged children have demonstrated that physical activity is protective against accelerated weight gain and inversely associated with change in body fatness.<sup>2,3</sup> Additionally, increased physical activity has been found to promote weight loss in obese preschool-aged children.<sup>4</sup>

Accurate quantification of physical activity in early childhood is recognized as being fundamentally important for a number of reasons including; measuring physical activity levels and changes to these levels; establishing dose-response relationships between physical activity and health outcomes; allowing effectiveness of interventions to be ascertained; and to identify children at increased health risk because of their physical inactivity.<sup>5</sup> Because physical activity in preschoolers usually occurs during free play rather than during structured activities, and this play consists of short intermittent bouts of activity with frequent rest periods, acceptable valid and reliable measurement and assessment tools for this age group are limited.<sup>6</sup> Currently, accelerometry is the most commonly used objective approach to monitoring free-living physical activity in young children, and has recently been validated by Pate et.al.<sup>7</sup> However, accelerometers' high cost poses a significant barrier for use in large studies.<sup>7,8</sup>

A pedometer has been noted in many studies as being an objective measure of physical activity in preschool-aged children. Pedometers provide valid assessments of the total volume of physical activity performed by children and are especially useful in studies in which the goal is to document relative changes in physical activity or to rank order groups of children on physical activity participation.<sup>9</sup> Because of the

pedometer's cost-effectiveness, this method has great potential for measuring physical activity in large samples.<sup>6, 9, 10</sup>

It is only recently that pedometers have been tested on young children. Validity of pedometers with preschoolers has been demonstrated by McKee et al. ( $r=0.95$ ), and Oliver et al. ( $r=0.64$ ).<sup>5, 11</sup> In these studies direct observation was used to validate pedometers during preschool free-play sessions. Hands et al. compared direct observation to both accelerometry and pedometry in five- and six- year olds and found that a pedometer ( $r = 0.81$ ) was more effective in accurately predicting all levels of physical activity compared to an accelerometer ( $r = 0.59$ ).<sup>6</sup> Further, Cardon and De Bourdeaudhuij, found a high correlation ( $r=.73$ ) between pedometer outputs and accelerometer-based minutes of engagement in moderate-to-vigorous physical activity (MVPA).<sup>12</sup>

In addition to validating assessment measures for preschoolers, the Centers for Disease Control and Prevention (CDC) has also highlighted the relationship between physical activity and motor skills as another priority area of research for physical activity and preschoolers.<sup>10</sup> Few studies have examined the relationship between habitual physical activity and fundamental motor skills, and in those studies small positive correlations between the two have been found.<sup>13, 14</sup> Beyond examining relationships between fundamental movement skills and physical activity, studies exploring the relationships between body composition and physical fitness and/or movement skills have been conducted. While several studies have reported significant correlations between body composition and health related fitness components (cardiorespiratory fitness and muscular endurance), Ellery found no

relationship between skinfold thickness and gross motor skill performance among 220 preschool children.<sup>15</sup> Further exploration into potential relationships between physical activity, fundamental motor skills, and body composition through longitudinal and intervention studies might provide greater ability to detect associations between these variables.<sup>14</sup>

This study reports baseline data in weight status, physical fitness, gross motor skills, and physical activity for 267 preschoolers participating in the *Food Friends Get Movin' with Mighty Moves*<sup>™</sup> intervention study. Next, the potential for pedometers to assess physical activity in this young population was examined. Lastly, relationships between weight status, physical fitness, gross motor skills, and physical activity were explored.

## **Methods**

### ***Participants and Procedures***

*Food Friends Get Movin' with Mighty Moves*<sup>™</sup> was a randomized controlled trial targeting 3- to 5-year children enrolled in Colorado Head Start centers. Eight Head Start centers (4 rural and 4 urban) who had previously implemented the *Food Friends*<sup>®</sup> nutrition program were recruited to participate in the 2 x 2 factorial designed study. The two factors included treatment and geographic location (within treatment). Based on their geographic location, centers were randomly assigned to participate in the *Mighty Moves* experimental condition or the control condition. Head Start centers self selected classrooms to participate. Recruitment packets, including consent forms, were provided by research staff in both English and Spanish and distributed to parents by teachers and Head Start staff. Each center

was asked to recruit a minimum of 36 families to be included in the study. If more than 36 families were recruited, participation in the study would be limited to those children who were present on the day researchers were on site to collect baseline data.

Data were collected at the Head Start centers for anthropometric measures, physical fitness testing, and gross motor skill assessment. Researchers were trained and inter-rater reliability was established prior to the start of the study. In addition to on-site assessments, a packet containing instructions, pedometers, log sheets, a survey, and compensation form was sent home with each subject. Information contained in the packet was translated to Spanish. Parents received a packet in the language of their choice. Parents who returned completed packets were compensated \$40. Both on-site testing methodologies and instruments contained in the packet were pilot tested for feasibility, time, and reliability.<sup>16,17</sup> This research was approved by the Human Research Committee at Colorado State University.

### ***Sociodemographic variables***

Sociodemographic information for the child was provided by the parent/caretaker who returned the study packet. Birthdates were provided on the consent form to calculate age. Gender and ethnicity were recorded at the time of on-site assessment to ensure that this information was available for all participants. When necessary, information was confirmed with teachers and center staff.

### ***Child Weight Status***

Height was measured to the nearest 0.1 centimeters using a portable stadiometer

(Seca corp, Hamburg, Germany). Weight was measured to the nearest 0.1 pounds using an electronic scale (Lifesource ProFit UC321; Milpitas, CA). Participants were asked to remove their shoes and any heavy outer clothing. Body Mass Index (BMI), BMI percentiles, and BMI z-scores were calculated by EpiInfo software (Centers for Disease Control and Prevention (CDC), Atlanta, GA). Children's weight status was classified using their sex- and age-specific BMI percentile derived from CDC's Growth Charts: 'Normal weight' included those with a BMI in the 5<sup>th</sup> percentile to less than the 85<sup>th</sup> percentile; 'At risk for overweight' included those with a BMI in the 85<sup>th</sup> to less than the 95<sup>th</sup> percentile, or 'Overweight' if their BMI was greater than the 95<sup>th</sup> percentile.<sup>18</sup>

### ***Physical Fitness***

Four physical fitness tests, previously found to be reliable in 4- and 5-year old children, were used.<sup>19</sup>

- Sit-n-reach (flexibility) was measured with a portable Sit-n-Reach unit (Health and Education Services, Addison, IL) in the sitting position (no shoes) to the nearest inch. Three attempts were recorded and the best of the three was used in data analysis.
- Sit-ups for 30 seconds (trunk strength) were done with the subject lying on a mat, arms placed across their chest, knees bent at 90° and feet (no shoes) flat on the mat. The number of correct sit-ups completed in 30 seconds was recorded.
- Shuttle run 4 x 30 feet (running speed and agility) included running between two cones, touching the cone, and running back towards the other cone.

Children ran individually and were timed with a stopwatch. Time was recorded to the nearest 0.1 seconds.

- Shuttle run, 3 minutes (cardiorespiratory endurance) included running between two cones and following the taped arrows on the floor around the cone. The number of laps completed in 3 minutes was recorded ( $\pm .25$  laps)

### ***Gross Motor Skills***

The Peabody Developmental Motor Scales, second edition (PDMS-2), a criterion- and norm-referenced motor skill test designed for children from birth through 5 years of age, was used.<sup>20</sup> The three sub-tests composing the Gross Motor Scale – stability (30 total items), locomotor (89 total items), and object manipulative (24 total items) – were conducted with participants. The number of items conducted with a child for each sub-test varied based on the child's basal level for each sub-test. On average, each child was tested on 10 stability items, 29 locomotor items, and 16 object manipulation items. The PDMS-2 items were scored 0 when the child's performance did not meet the stated criteria, 1 when the performance partially met criteria and 2 when the child's performance met all of the stated criteria.<sup>20</sup> Raw scores for each sub-test were calculated and then transformed into normalized standard scores. A Gross Motor Quotient, using all three sub-tests, was also calculated. Testing time averaged between 20-25 minutes.

### ***Physical Activity***

Physical activity was assessed using Walk-4-Life pedometer; model W4L Classic (Plainfield, IL). A pedometer, with safety strap, was sent home along with a log to

record the number of daily steps. Parents were asked to put the pedometer on the child when the child got out of bed and to take it off when the child went to bed. They were asked to record the number of total steps taken each day for six days – four weekday and two weekend days. Parents were also asked to record notes about if the child did not wear the pedometer for a specific time during the day, what types of activities they participated in, etc. Mean steps were calculated for all six days as well as for weekdays and weekend days. Parents also were asked to wear a pedometer for six days and record their daily steps. These findings will be reported elsewhere.

### ***Statistical Analysis***

Data were analyzed using the Statistical Package for Social Science (SPSS 15.0 Windows; SPSS, Inc., Chicago, IL) program. Descriptive statistics (percentage, mean, standard deviation) were obtained for demographic, anthropometric, and weight status variables. Two-way analysis of variance (ANOVA) was used to assess if a difference existed between treatment groups and geographic location for outcome variables: step counts, physical fitness tests, and gross motor standard scores. No significant differences were found hence the data was collapsed. Histograms and box plots were computed to assess distribution (skewness and kurtosis) and variance, respectively. All outcome variables, with the exception of sit-ups, had normal distribution. One-way ANOVA tests were used to examine differences in outcome variables by treatment, age, ethnicity, gender, and weight status (BMI). Paired-sample t-tests were used to assess differences in pedometer step counts for all days, week days, and weekend days. Pearson's Chi-square test for goodness of fit was used to examine if a difference existed for sit-ups by

treatment. Pearson r correlation coefficients were generated to assess relationships between physical activity (step counts), physical fitness, gross motor skills, and weight status. Spearman correlation coefficient was calculated to assess the relationship between sit-ups and the other outcome variables.

## **Results**

### ***Participants and Procedures***

Two hundred and seventy-four children were recruited to participate in the study. Due to absenteeism and some children declining to participate, baseline data was collected on 267 children. Study packets were sent home to all 267 families and 182 complete packets were returned (68% response rate).

### ***Sociodemographic Variables***

Sociodemographic data for the study population is presented in Table 6-1.

Ethnically the study population is representative of the larger Colorado Head Start population, which is comprised of 60.8% Hispanic, 32.9% non-Hispanic White, and 13.4% other-ethnicities.<sup>21</sup> No significant differences were found for age and similar ratios of males to females and rural to urban were found between groups.

### ***Child Weight Status***

In regards to child weight status, no significant difference in BMI was found between treatment groups (Table 6-1). Further, no differences in BMI were found between ethnicities or gender. Classification of weight status, based on BMI-percentile, for the study participants is presented in Table 6-2. Collectively, based on CDC classification, 13.3% of participants were overweight and 23.9% were at risk for

overweight, thus 37.2% were above normal weight. These numbers are similar to NHANES data but much higher than Colorado WIC data for 2- to 5-year old children.<sup>22, 23</sup>

### ***Physical Fitness***

Physical fitness data are provided in Table 6-3 for three (sit-n-reach, shuttle run, and three minute run) of the four tests. There was no significant difference in fitness tests between the treatment groups, by location or by ethnicity. A significant difference in sit-n-reach by gender did exist ( $F=11.82$ ,  $p<.001$ ) with girls performing better than boys. Further, a significant difference by BMI was found in the shuttle run ( $F=3.383$ ,  $p=.019$ ) and 3-minute run ( $F=3.053$ ,  $p=.029$ ) with heavier children running slower and less laps than children of normal weight.

Data for sit-ups, because it was non-parametric, was transformed from the number sit-ups completed into dichotomous data – either the child could or could not do sit-ups. The percentage of children who could do sit-ups was 48.10% and 25.95 %for the experimental and control groups, respectively. Pearson Chi-Square test indicated a significant difference between groups ( $\chi^2 = 13.77$ ,  $p<.001$ ) and age ( $\chi^2 = 29.596$ ,  $p<.001$ ), with older children capable of doing sit-ups more so than younger children. No significant differences were found by ethnicity, gender, or BMI.

### ***Gross Motor Skills***

Standard scores for the three gross motor subtests (stability, locomotor, and object manipulation) as well as a Gross Motor Quotient (GMQ) are presented in Table 6-4. For PDMS-2 standard scores, a score between 8 and 12 is considered 'Average.'<sup>20</sup>

Both stability and locomotor scores for both the experimental and control groups fell within this range. Object manipulation for both groups was slightly lower, and hence, is categorized as 'Below Average,' An 'Average' GMQ score was between 90-110, thus the mean GMQ for the two study groups falls within this range.<sup>20</sup> No significant differences were found between treatment groups, location, ethnicity or BMI. A gender difference was found in stationary skills ( $F= 4.17, p=.042$ ) with girls performing better than boys and in object manipulative skills ( $F=16.41, p<.001$ ) with boys performing higher than girls.

### ***Physical Activity***

The mean and standard deviation for six days of pedometer counts as well as weekday counts (4 days) and weekend counts (2 days) are presented in Table 6-5. The average daily step count and standard deviation in this study was  $9,509 \pm 3,599$ . No significant differences were found between groups or by location, gender, ethnicity, and age. Step counts for weekdays were found to be significantly lower than steps taken on weekend days (Table 6-5). Additionally, a significant difference in the number of steps was found by weight status for all days ( $F=2.776, p=.043$ ) and weekdays ( $F=4.932, p=.003$ ) but not for weekend days ( $F=.636, p=.636$ ). Overweight children had fewer steps than normal weight children.

### ***Relationships between Weight Status, Motor Skills, Physical Activity and Physical Fitness***

With no difference existing between treatment groups or by geographic location, the data was collapsed to examine the relationships between variables within the following sub-groups: BMI (n=263), physical activity (n=182), gross motor skills

(n=244) and physical fitness (n=263). Correlation coefficients are presented in Table 6-6. As one would expect, correlations within sub-groups are significantly associated. Additionally, significant associations were found between: BMI and 3 physical fitness tests (shuttle run, 3-minute run, and sit-ups); physical activity and locomotor skills, with weekend step counts being more strongly associated than all days and weekdays; Gross Motor Quotient scores with step counts from all days and weekend days; and gross motor skills and physical fitness. No associations were found between BMI and physical activity nor BMI and gross motor skills.

## **Discussion**

The prevalence of overweight and obesity among Americans is increasing at an alarming rate. Among children ages 2 to 5, the prevalence of overweight increased from 7% in 1994 to 10% in 2000 to almost 14% in 2004.<sup>23, 24</sup> This study supports these figures with 13.3% of the study population considered 'overweight' and an additional 23.9% falling in to the 'at risk for overweight category'. Inadequate physical activity levels, combined with poor dietary habits, are contributing factors to the rise in childhood overweight. Because health habits, including nutrition and physical activity, are formed early in life, interventions focusing on establishing healthful habits are needed as part of obesity prevention efforts. Unfortunately, obesity prevention efforts are lacking for the childcare/preschool setting.

In an effort to fill this void, a physical activity program, *Food Friends Get Movin' with Mighty Moves™*, was added to the successful *Food Friends®* nutrition program.<sup>25-27</sup> Baseline data on children participating in the *Food Friends Get Movin' with Mighty Moves™* study reflect the continued rise in childhood overweight as well as low

levels of physical activity. To measure physical activity levels in a relatively large number of preschoolers, in geographically diverse areas of Colorado, pedometers were chosen due to the low-cost of the instrument, low-cost of research staff time and resources, and because of their potential as a valid measure of daily physical activity for both preschoolers and adults (teachers and parents).<sup>7,9</sup>

The use of pedometers is becoming more widely used in research and practice. To effectively interpret and use pedometer assessed ambulatory activity, normative values or benchmarks for interpreting change and for comparison purposes is necessary.<sup>28</sup> To the best of the authors' knowledge, only one other study has reported daily step counts in preschool-aged children.<sup>12</sup> Cardon and De Bourdeaudhuij found that preschoolers averaged 9,980 steps per day. The present study found comparable average daily step counts, 9,509 per day, with no significant differences found by gender, age, ethnicity, or weight status. With recent studies validating pedometer steps with direct observation and accelerometry in young children, it can be concluded that pedometers provide valid measures of daily physical activity levels in this age group.<sup>5,6,11,12</sup>

While adults have been shown to over-estimate the level of physical activity of youth, most data support the conclusion that the majority of children tend to be physically inactive.<sup>29</sup> Dowda found that preschoolers were engaged in moderate to vigorous physical activity (MVPA) only 27% of the time they were observed by researchers, failing to meet current recommendations for participation in physical activity.<sup>30</sup> Cardon and De Bourdeaudhuij, in correlating preschoolers' daily steps counts (pedometer) to minutes in MVPA (accelerometers), determined a daily step count of

13,874 equated to 1-hr of MVPA. In their study only 8% of the children reached this number of daily steps.<sup>12</sup> Using their cut point in the current study, 7% (n=13) of children reached this threshold, supporting Cardon and De Bourdeaudhuij's conclusion that activity levels in preschool-aged children is low. Within the thirteen children who averaged greater than 13,874 steps over six days, there was no significant difference by gender, age, ethnicity, or weight status.

Examining the relationships between physical activity, gross motor skills, physical fitness and weight status is essential for future intervention efforts. Contrary to Cardon and De Bourdeaudhuij, this study found weekend steps to be significantly higher than weekday steps.<sup>12</sup> Also, a stronger association was found between weekend steps (versus weekday steps) and gross motor skills, particularly locomotor skills, suggesting that children who are more active on weekends have more developed motor skills. Because of the potential impact on gross motor skill development, further exploration into this relationship is warranted. Is it truly that children, and possibly families, are more active on the weekends or is it that there are not enough physical activity opportunities during the school day? Secondary influencers – teachers and parents – as well as preschool and home environments play a large role in children's physical activity levels. Parental BMI, role-modeling, encouragement, and physical activity levels have been shown to have an impact on young children's activity levels.<sup>22,31-36</sup> Moreover, physical activity levels can vary based on the preschool policies and practices, specifically, environments that include better furnishings and adequate space; college-educated teachers; quality of activities offered; and program structure; and interactions among the children and between the children and teachers.<sup>30</sup> Further research is needed to explore the

relationships between children's activity levels and those who influence these children – preschool teachers and parents.

This study has several limitations. Because this study was conducted with a low-income, high Hispanic population, data presented here are not generalizable to preschoolers as a whole. Next, there may have been some selection bias as to who signed up for the study. Some families may have declined to participate because of low-literacy (not understanding the consent form), immigration status, or perception of child's weight status, either positive or negative, and the perceived need to be a part of the study. Further, several limitations existed as far as data collection. Because data was collected at eight different Head Start centers, facilities to conduct gross motor skill and physical fitness assessment varied. For example, 30 feet of running space was either found in a gym, a hallway, or the outside playground. Regardless of location, distractions were many (e.g. peers, dandelions, gym equipment). While this could be controlled for at pre- to post-testing, it could not totally be controlled for by location. As for pedometers, because they could not be sealed, there is an increased chance of premature resetting as well as reporting bias. The pedometers were difficult to open for adults, thus, most young children could not open them. Lastly, physical activity (pedometers) assessment was conducted during the month of October. In some parts of Colorado, particularly those areas at high elevation, weather at this time of year is very unpredictable, thus it may have had an impact on physical activity levels. While several limitations existed, this study contributes to a much needed area of the literature, specifically in establishing normative values for pedometer steps in preschoolers as well as in

examining relationships of various activity and motor skills outcomes with weight status.

### **Conclusion**

The quality and quantity of physical activity in the childcare setting varies as well as in the home environment. To ensure adequate accumulation of moderate-to-vigorous physical activity by young children, it is recommended that preschools should consider adding structured physical activity to their programs.<sup>30</sup> *Food Friends Get Movin' with Mighty Moves™* is a structured 18 week physical activity program developed to aide teachers and parents in increasing physical activity opportunities in the classroom and home environment. The results reported here illustrate the need for such a program to prevent childhood overweight among preschool-aged children.

**Table 6-1:** Demographics of Study Participants

Characteristic	Experimental			Control		
	n	% or Mean	SD	n	% or Mean	SD
<b>Age at study entry (months)</b>	133	53.0	6.82	134	51.5	6.64
<b>Gender (%)</b>	133			134		
Male	76	57.1		72	53.7	
Female	57	42.9		62	46.3	
<b>Ethnicity (%)</b>	133			134		
Asian	1	0.8		1	0.7	
African American	2	1.5		5	3.7	
Hispanic	80	60.2		73	54.5	
Caucasian	41	30.8		47	35.1	
Other/Multi	9	6.8		8	6.0	
<b>Location (%)</b>	133			134		
Urban	68	51.1		65	48.5	
Rural	65	48.9		69	51.5	
<b>Anthropometric Measures</b>	132			131		
Height (cm)		102.97	6.12		102.56	5.23
Weight (kg)		17.63	3.06		17.6	2.96
BMI		16.54	1.75		16.65	1.94
BMI z-score		0.63	1.07		0.72	1.08

No significant differences existed between treatment groups

**Table 6-2:** Weight Status of Study Participants

CDC Weight Classification (%)	Experimental (n=132)		Control (n=131)	
	n	%	n	%
Overweight (>95%)	19	14.4	16	12.2
At risk for Overweight (85.0-94.9%)	34	25.8	29	22.1
Normal Weight	76	57.6	85	64.9
Underweight (<5%)	3	2.2	1	0.8

**Table 6-3:** Physical Fitness Outcomes

Physical Fitness Test	Experimental			Control			Total		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Sit-N-Reach (inches)*	132	28.63	4.46	131	28.16	3.98	263	28.4	4.23
Shuttle Run (time)	132	22.24	5.35	130	22.11	4.35	262	22.2	4.86
3 Minute Run (laps)*	132	24.83	6.31	128	25.86	5.29	259	25.3	5.85

No significant differences existed between treatment groups

\* Higher scores are desired

**Table 6-4:** Gross Motor Skill Outcomes

Gross Motor Skills	Experimental			Control			Total		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Gross Motor Quotient*	122	93.41	9.16	122	93.54	7.93	244	93.48	8.55
Stability Standard Score**	131	9.87	2.18	127	10.20	2.25	258	10.03	2.12
Locomotor Standard Score**	131	9.21	1.76	127	9.28	1.49	258	9.25	1.63
Object Manipulation Standard Score**	122	7.62	1.85	122	7.43	1.45	244	7.53	1.66

No significant differences existed between treatment groups

\*Quotient Normative Score (mean  $\pm$  SD) = 100  $\pm$  15

\*\* Subtest Normative Score (mean  $\pm$  SD) = 10  $\pm$  3

**Table 6-5:** Physical Activity Outcomes – Daily Mean Pedometer Steps

Physical Activity – Mean Pedometer Steps	Experimental (n=83)			Control (n=102)			Total (n=182)		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Mean Step Counts – All Days	83	9707.53	3057.72	102	9346.34	3997.27	184	9509.27	3599.05
Mean Step Counts – Week Days	83	9355.76 <sup>a</sup>	2925.55	102	8974.54 <sup>b</sup>	3481.22	184	9146.50 <sup>c</sup>	3239.39
Mean Step Counts – Weekend Days	82	10392.00 <sup>a</sup>	4601.97	101	10176.49 <sup>b</sup>	6148.40	182	10273.59 <sup>c</sup>	5492.34

No significant differences existed between treatment groups

Significant differences existed within treatment groups between weekday counts and weekend counts:

a (t= -2.39; p=.02); b (t= -2.61; p=.01); c (t= -3.53; p=.001)

**Table 6-6:** Relationship between Weight Status Physical Fitness, Gross Motor Skills, and Physical Activity (Pearson Correlations)

		Weight Status	Physical Activity			Gross Motor Skills				Physical Fitness			
		BMI	Steps-All Days	Steps-Week days	Steps-Week end	GMQ	Stability	Locomotor	Object Manipulation	Sit-n-Reach	Shuttle Run	3-minute Run	Sit-ups <sup>#</sup>
Weight Status	BMI	1	-.032	-.057	.009	-.048	-.075	-.095	.07	-.022	.164*	-.146†	-.105†
	Physical Activity	Steps-All Days	-.032	1	.930*	.861*	.159†	.093	.191†	.07	.046	-.059	.095
Steps-Weekdays		-.057	.930*	1	.615*	.106	.1	.133	.029	.015	-.044	.114	.087
Steps-Weekend		.009	.861*	.615*	1	.184†	.093	.224*	.094	.08	-.061	.041	.089
Gross Motor Skills	Gross Motor Quotient (GMQ)	-.048	.159†	.106	.184†	1	.773*	.771*	.63*	.14†	-.341*	.264*	.421*
	Stability	-.075	.093	.100	.093	.773*	1	.417*	.144†	.077	-.269*	.220*	.372*
	Locomotor	-.095	.191†	.133	.224*	.771*	.417*	1	.337*	.195*	-.305*	.220*	.318*
	Object Manipulation	.070	.07	.029	.094	.63*	.144†	.337*	1	.038†	-.177*	.150†	.177*
Physical Fitness	Sit-n-Reach	-.022	.046	.015	.08	.14†	.077	.195*	.038†	1	-.094	.130†	.034
	Shuttle Run	.164*	-.059	-.044	-.061	-.341*	-.269*	-.305*	-.177*	-.094	1	-.476*	-.267*
	3-minute Run	-.146†	.095	.114	.041	.264*	.220*	.220*	.150†	.130†	-.476*	1	.321*
	Sit-ups <sup>#</sup>	-.105†	.11	.087	.089	.421*	.372*	.318*	.177*	.034	-.267*	.321*	1

\*p<0.01, † p<0.05,

<sup>#</sup> Spearman Correlations were used with Sit-ups

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## CHAPTER 7

### **RESULTS FROM *FOOD FRIENDS GET MOVIN' WITH MIGHTY MOVES™*: A RANDOMIZED CONTROLLED TRIAL TO PREVENT OBESITY IN LOW-INCOME, MINORITY PRESCHOOLERS**

#### **Abstract**

##### ***Objective***

To assess the efficacy of a physical activity intervention on weight status, gross motor skills, physical fitness, and physical activity levels of preschoolers.

##### ***Research Methods and Procedures***

This study was a randomized controlled trial of 3- to 5-year old children (n=201) enrolled in 8 Head Start centers in Colorado. The intervention program, *Food Friends Get Movin' with Mighty Moves™*, was conducted in 4 centers over an 18 week timeframe. On-site measures included height, weight, physical fitness (sit-ups, sit-n-reach, shuttle run, 3-minute run), and gross motor skill (Peabody Developmental Motor Scales) assessments. BMI, BMI z-score and BMI percentiles were calculated. Physical activity was assessed by pedometers over a 6-day timeframe (4 weekdays and 2 weekend days), daily step counts were recorded by parents.

## **Results**

Treatment did not have an effect on BMI and BMI z-scores, after controlling for covariates (BMI:  $F=.47$ ,  $p=.49$ ; BMI zscore:  $F=.34$ ,  $p=.56$ ). Gross motor skills and fitness were impacted by treatment: Gross Motor Quotient ( $F=10.58$ ,  $p=.001$ ), stability standard score ( $F=15.58$ ,  $p<.0005$ ), locomotor standard score ( $F=4.12$ ,  $p=.04$ ), Sit-n-Reach ( $F=4.72$ ,  $p=.03$ ), and 3-minute run ( $F=7.33$ ,  $p=.01$ ). No difference was found for physical activity by treatment. Gender, age, weight status, and classroom environment but not ethnicity had an effect on several variables.

## **Discussion**

Findings suggest that the dose of classroom programming was adequate for gross motor and physical fitness enhancement but not for physical activity. *Food Friends Get Movin' with Mighty Moves™* can play a role in establishing healthful habits which may decrease the risk for overweight later in life.

## **Introduction**

The prevalence of overweight among preschool-aged children in the United States is increasing at an alarming rate. According to the Pediatric Nutrition Surveillance Report, overweight in children aged 2- to 5-years has increased by 35% during a ten year period, from 11.0% in 1995 to 14.8% in 2004. Further, in addition to those children considered overweight, 16.2% of preschoolers are considered at risk for overweight.<sup>1</sup> Collectively, 1 out of every 3 preschool-aged children is considered to be either at risk for overweight or overweight. While overweight has increased in both genders, all races and ethnicities, and across all age groups, disparities in prevalence of overweight exist. Overweight and obesity are particularly common

among minority groups and those with limited resources.<sup>2</sup> Minority children, specifically Native American and Hispanic children, have higher rates of overweight than other ethnic groups.<sup>1, 3-5</sup>

With the increase in childhood overweight, it has become apparent that interventions targeting the highest risk populations are needed. The preschool years provide an opportunity to establish healthful eating and physical activity behaviors which can lessen the growth of obesity. Unfortunately, with few exceptions, preschoolers, as a whole, have been largely ignored when it comes to obesity prevention efforts.<sup>6-8</sup>

Obesity prevention programs for preschoolers can provide early experiences with foods and flavors, help develop healthy food preferences, monitor rate of weight increases to prevent early adiposity rebound, and provide child and parent nutrition education.<sup>9, 10</sup> In addition, programs can expose preschoolers to age- and developmentally-appropriate physical activities that explore new movements and enhance motor skill development.<sup>11</sup> Because low-income, ethnic minority preschoolers are at greatest risk, the Head Start program has vast potential to implement and support obesity prevention efforts, including nutrition education and physical activity interventions.<sup>8, 12</sup>

*Food Friends- Making New Foods Fun for Kids®* is a successfully evaluated social marketing campaign aimed at increasing children's willingness to try new foods in an effort to enhance food choice, and hence dietary variety.<sup>13-15</sup> A physical activity companion program, *Food Friends Get Movin' with Mighty Moves™*, has been developed to improve the programs' overall efforts to establish healthful habits that

prevent childhood overweight early in life.<sup>16-18</sup> A randomized controlled trial was conducted with eight Head Start centers during the 2006-07 school year. There were two study objectives: 1) to alter the upward trajectory of overweight in preschool-aged children participating in *Food Friends Get Movin' with Mighty Moves*<sup>™</sup> compared to children enrolled in control Head Start centers; 2) to increase physical fitness, gross motor skills, and/or physical activity levels in young children.

## **Methods**

### ***Study Design***

*Food Friends Get Movin' with Mighty Moves*<sup>™</sup> was a randomized controlled trial targeting 3- to 5-year children enrolled in Colorado Head Start centers. Eight Head Start centers (4 rural and 4 urban) who had previously implemented the *Food Friends*<sup>®</sup> nutrition program were recruited to participate in the 2x2 factorial designed study. The two factors included treatment and geographic location (within treatment). Based on their geographic location, centers were randomly assigned to participate in the *Mighty Moves*<sup>™</sup> experimental condition or the control condition.

A power analysis indicated that a standard deviation of 10.5 in the Gross Motor Quotient of the Peabody Developmental Motor Scales could be detected with a sample size of 20 per group for 95% power.<sup>17</sup> Therefore, to account for any potential center differences and attrition, a convenience sample of more than 36 per center was sought. Recruitment packets, including consent forms, were provided by research staff in both English and Spanish and distributed to parents by teachers and Head Start staff. This research was approved by the Human Research Committee at Colorado State University.

### ***Intervention: Food Friends Get Movin' with Mighty Moves™***

Program development and rationale for *Food Friends Get Movin' with Mighty Moves™* is described in detail elsewhere.<sup>16,18,19,21</sup> To summarize, the *Mighty Moves™* physical activity intervention was 18 weeks in length and was conducted in the classroom 4 days a week for 15-20 minutes each day, for a total of 72 lessons. Program components were developed using a Social Marketing framework in which constructs of the Social Learning Theory were embedded.<sup>22-23</sup> Lesson and activities were led by the classroom teacher. Each week focused on a skill or group of skills from one of the three gross motor skill categories: stability, locomotor, or manipulative. Early in each week, children were introduced to a motor skill with movement concepts added as the week progressed. Later in the program, skill patterns, a combination of more than one motor skill, were incorporated into activities.

Creatively, graphics depicting each of the *Food Friends®* characters participating in different physical activities were developed.<sup>17</sup> These activities represented different motor skills, which were presented to children as *Mighty Moves™*. In addition to having a *Mighty Move™*, each character also had a superpower. For example, Corrine Carrot's *Mighty Moves™* included stability skills – bending, twisting, and turning – and X-ray vision was her superpower. Characters were used to introduce gross motor skills and movement concepts as well as lead children on imaginary musical journeys through the town of Healthadelphia™. Materials supporting the lessons, as well as creative themes and concepts, were provided for each classroom and included: a teacher activity binder, a custom musical CD, polypots (rubber mats), flashcards, puppets, scarves, balls, beanbags, ropes, and parent materials.

In addition to the new physical activity component in the treatment classrooms, both treatment and control classrooms continued to implement the *Food Friends*® program. *Food Friends*® is a 12-week program which includes: a 15-20 minute nutrition activity once per week, reading storybooks that support the “try new foods” theme once per week, and opportunities to try new foods twice each week. Materials for the *Food Friends*® nutrition component include, for example, puppets, storybooks, placemats, a jigsaw puzzle, memory card game, flashcards, parent materials.<sup>14, 25, 26</sup>

Prior to the start of the study, teachers were trained on program implementation and the study procedures, and provided with materials. Due to the difference in the length of the program components, implementation was staggered with *Mighty Moves*™ beginning in early November and *Food Friends*® in late January. All children participated in classroom activities, while only children with consent participated in the various assessments.

### **Data Collection**

Data was collected at the Head Start centers for anthropometric measures, physical fitness testing, and gross motor skill assessment at baseline and immediately following the 18-week intervention. Researchers were trained to criteria prior to the start of the study.<sup>27,28</sup> In addition to on-site assessments, a packet containing instructions, pedometers, log sheets, a survey, and compensation form was sent home with each subject. Information contained in the packet was translated to Spanish. Parents received a packet in the language of their choice. Parents who

returned completed packets were compensated \$20 at baseline and an additional \$20 at post-test.

### *Sociodemographic variables*

Sociodemographic information for the child was provided by the parent/caretaker who returned the study packet. Birthdates were provided on the consent form to calculate age. Gender and ethnicity were recorded at time of on-site assessment to ensure that this information was available for all participants. When necessary, information was confirmed with teachers and center staff.

### *Child Weight Status*

Height was measured using a portable stadiometer (Seca corp; Hamburg, Germany). Weight was measured using an electronic scale (Lifesource ProFit UC321; Milpitas, CA). Body Mass Index (BMI), BMI percentiles, and BMI z-scores were calculated by EpiInfo (Centers for Disease Control and Prevention (CDC), Atlanta, GA). Children's weight status was classified using their sex- and age-specific BMI percentile derived from CDC's Growth Charts.<sup>29</sup>

### *Physical Fitness*

Four physical fitness tests, previously found to be reliable in 4- and 5-year old children, were used.<sup>30</sup>

- Sit-n-reach (flexibility) was measured with a portable Sit-n-Reach unit (Health and Education Services, Addison, IL). The best of 3 attempts was recorded to be used in data analysis.

- Sit-ups for 30 seconds (trunk strength) were done and the number of correct sit-ups completed in 30 seconds was recorded. This data was transformed into dichotomous data based on whether or not the child could or could not do a sit-up.
- Shuttle run 4 x 30 feet (running speed and agility) was timed and recorded to the nearest 0.1 seconds.
- Shuttle run, 3 minutes (cardiorespiratory endurance) was comprised of the number of laps completed in 3 minutes. Laps were recorded to the closest quarter of a lap.

### *Gross Motor Skills*

The Peabody Developmental Motor Scales, second edition (PDMS-2), a norm- and criterion-referenced motor skill test designed for children from birth through 5 years of age, was used.<sup>31</sup> The three sub-tests composing the Gross Motor Scale – stability (30 total items), locomotor (89 total items), and object manipulative (24 total items) – were conducted with participants. The number of items conducted with a child for each sub-test varied based on the child’s basal level for each sub-test. On average, each child was tested on 10 stability items, 29 locomotor items, and 16 object manipulation items. Testing time averaged between 20-25 minutes. Raw scores for each sub-test were calculated and then transformed into normalized standard scores. A Gross Motor Quotient, using all three sub-tests, was also calculated.<sup>31</sup>

### *Physical Activity*

Physical activity was assessed using Walk-4-Life pedometer; model W4L Classic

(Plainfield, IL). A pedometer, with safety strap, was sent home along with a log to record the number of daily steps. Parents were asked to record the number of total steps taken each day for six days – four weekday and two weekend days. Mean steps were calculated for all six days as well as for weekdays and weekend days. Parents also were asked to wear a pedometer for six days and record their daily steps. These findings will be reported elsewhere.

### ***Statistical Analysis***

Data were analyzed using the Statistical Package for Social Science (SPSS 15.0 Windows; SPSS, Inc., Chicago, IL) program. Descriptive statistics (percentage, mean, standard deviation) were obtained for demographic, anthropometric, and weight status variables. With the exception of sit-ups, no significant difference existed at baseline between treatment groups and geographic location for outcome variables: step counts, physical fitness tests, gross motor standard scores, and weight status.<sup>20</sup> Data for the two geographic groups were collapsed by treatment group. Paired-sample t-tests, controlling for treatment, were used to assess differences between baseline and post-test outcome variables. Pearson's Chi-square test for goodness of fit was used to examine if a difference existed from baseline to post-test for sit-ups by treatment. Next, two-way analysis of variance (ANOVA), controlling for covariates (classroom, ethnicity, age, gender, and BMI z-score), was used to assess a difference in outcome variables at post-test by treatment. It should be noted that baseline outcome values were originally included as a covariate but they did not impact the results, so they were removed from the analysis. Lastly, paired-sample t-tests, within the intervention group, were calculated for differences in significant outcome measures (BMI, BMI z-score, physical fitness,

and gross motor skills) between baseline and post-test, controlling for significant covariates –age and BMI.

## **Results**

Two hundred and seventy-four children were recruited to participate in the study at baseline. Of the 274, baseline data for child weight status, gross motor skills, and physical fitness was collected on 267 children. Post-test data was collected on 201 children. Power for the study, based on gross motor skills (PDMS), was achieved at each of the 8 sites. Furthermore, complete study packets with pedometers were returned by 182 families at baseline and 101 families at post-test for a response rate of 68% and 50%, respectively. Demographic characteristics of the 201 study participants, in which both baseline and post-test data were collected, are presented in Table 7-1. No significant differences in participant characteristics existed between treatment groups at baseline.

In examining the study objective of change in weight status, initial findings, when not controlling for classroom, ethnicity, gender, and/or age; indicate a significant increase in BMI and BMI z-score within the treatment group (mean difference: BMI= 0.19 and BMI z-score = 0.13) but not the control group (mean difference: BMI= -0.08 and BMI z-score = -0.01) (Table 7-2). However, after controlling for these covariates, non-significant differences between treatment groups in BMI ( $p=0.49$ ) and BMI z-score ( $p=0.56$ ) were noted (Table 7-3).

Secondly, changes in gross motor skills, physical fitness, and physical activity from baseline to post-test by treatment group, are presented in Table 7-2. A significant

increase in gross motor skills for children participating in the *Food Friends Get Movin' with Mighty Moves™* program was found, including a significant increase in Gross Motor Quotient (GMQ) (mean difference from baseline to post-test = 5.73). Similar significant increases were found in individual motor subtests – stability, locomotor, and object manipulation – in the treatment group but not the control group. A decrease in GMQ was found in the control group (mean difference = -0.5) as well as a significant decrease in stability skills (mean difference = -0.63). These changes are not indicative of decrease in skill, but rather a potentially slower rate of motor development when compared to normative data.

After controlling for covariates (classroom, ethnicity, gender, age, and BMI z-score), significant differences by treatment were found in GMQ, stability, and locomotor skills (Table 7-3). Object manipulation skills were not significant by treatment ( $p=0.18$ ) but a significant gender effect was found. T-tests within the treatment condition for object manipulation skills indicate that girls significantly increased ( $t=-4.51, p<0.0005$ ) but boys did not ( $t=-1.73, p=0.089$ ). No other gender effects on motor skills were found. Further, no classroom or ethnicity effects were found on motor skills, but age and weight status had strong effects on GMQ, stability, and locomotor skills.

The intervention also had an impact on physical fitness (Table 7-2). For the 3-minute run the treatment group showed a significant increase in the number of laps completed (mean difference= 1.61). Both groups showed significant improvements in the shuttle run. No change was found for sit-n-reach in either group. However, when treatment was controlled for by covariates (Table 7-3), a significant difference

by treatment was found for sit-n-reach. Both shuttle run and 3-minute were still significant after controlling for covariates. Additionally, a strong gender effect was found for sit-n-reach ( $p < 0.0005$ ). T-tests within the treatment condition for sit-n-reach indicate that girls significantly increased ( $t = -2.21, p < 0.03$ ) but boys did not ( $t = -0.12, p = 0.85$ ) in the number of inches reached. The classroom as well as age and BMI z-score had a strong effect on treatment in physical fitness tests. No ethnicity effect was found on the three fitness tests.

The number of children who could complete a sit-up significantly increased in both treatment groups from baseline to post-test (treatment group:  $\chi^2 = 17.17, p < 0.001$ ; control group:  $\chi^2 = 13.59, p < 0.001$ ). Collectively, 60% of children could perform a sit-up at post-test compared to 34% at baseline.

No treatment effect was found for physical activity levels from baseline to post-test (Table 7-2) or when examining post-test levels with covariates of classroom, ethnicity, gender, age, or BMI z-score (Table 7-3). It should be noted that the change in steps from baseline to post-test in the control group approached significance. This cannot be explained by researchers.

Table 7-4 illustrates changes in BMI, gross motor skills, and physical fitness by age (3, 4, and 5 years of age) and weight status (normal and overweight). Physical activity was not included in this analysis because covariates had no-significant effect on step counts. T-tests within the treatment group illustrate significant increases in weight gain (BMI and BMI z-score) for 4- and 5-year olds as well as normal weight children, but not in 3-year olds and overweight children. In examining the effect of

age, 3- and 4-year olds increased significantly in motor skills, shuttle run and 3-minute run; while 5-year olds did not have significant increases in motor skills or the 3-minute run. Weight status also had an impact on improvement in motor skills and fitness. Normal weight children had significant increases in all motor skill categories and fitness tests, while overweight children had significant improvements in far fewer categories, locomotor skills and shuttle run only.

## **Discussion**

The prevalence of overweight in preschool-aged children continues to rise. The prevalence of children found to be overweight and at risk for overweight in this study, 11.9 % and 23.4%, respectively, are on par with national statistics.<sup>1,4,5</sup> This illustrates the need for obesity prevention efforts aimed at the young child. As noted earlier, few obesity prevention efforts for this audience have been reported in the literature. Two intervention studies, Hip-Hop to Health Jr. and MAGIC, had a similar objective to this study, decreasing weight gain, but with conflicting results.<sup>6,7</sup> Hip-Hop to Health Jr. did not see a significant difference in weight gain between treatments at post-intervention but did see significant changes at 1 year follow-up.<sup>6</sup> Conversely, MAGIC did not see significant changes between treatment groups at 6-month follow-up.<sup>7</sup> While this study did not see significant differences in BMI or BMI z-score at post-intervention, when controlling for covariates, reassessing weight gain at 1-year post-intervention may be needed to see a change in weight status.

The *Food Friends Get Movin' with Mighty Moves™* intervention did lead to significant changes in gross motor abilities and physical fitness levels when compared to the control group but did not lead to changes in physical activity. These findings suggest

that the dose of classroom programming was adequate for gross motor enhancement but may not have been for physical activity. The improvement in motor ability for this age group is important, as many children never develop certain mature patterns of motor skills and as a result they perform poorly as they grow older. These early failures can damage the child's self-esteem as well as lead to avoidance of movement. Children with low motor skills know that they can't move efficiently, they feel awkward, uncoordinated, and inhibited, thus leading to decreased movement.<sup>11</sup> Further examination of daily dose as well as program length and their impact on physical activity levels is warranted. Additional intervention strategies for physical activity aimed at the classroom environment as well as the home environment may be necessary.

The classroom environment appears to have an impact on physical fitness (flexibility, endurance and agility) as demonstrated by significant increases by the treatment group in the sit-n-reach, 3-minute run and shuttle run (Table 7-3). Others have shown the preschool environment to have an impact on physical activity levels.<sup>32, 33</sup> In one study, characteristics of a preschool had a much greater influence on physical activity than the child's personal demographic characteristics.<sup>33</sup> Another study found significant physical activity differences between preschools that differed on certain policies and practices.<sup>32</sup> Further insight into the impact of classroom environment factors, such as teacher attributes, space, length of school day, and amount of structured and unstructured activity offered; will be examined as part of this broader study.

In addition to the classroom effect, personal attributes were examined in relation to motor ability, fitness and activity levels. Children who were overweight or at risk for overweight did not improve as significantly in motor skills and fitness levels as did children of normal weight. However, no significant differences in physical activity levels by weight status were found. In a study by Trost et al., significant differences in activity levels in overweight boys were found when compared to normal weight boys, suggesting that decreased activity levels may lead to further adiposity gains in overweight children.<sup>34</sup> While a significant difference in physical activity at baseline was found by weight status (overweight children had lower levels than normal weight)<sup>20</sup>, data in this study illustrate that additional weight gain was not significant in the overweight group but it was in the normal weight children. Taken in conjunction with the non-significant difference in activity levels by weight status post-test, these findings suggest that activity levels may have less of an effect on additional weight gain in the preschool years. Clearly, more research in this area is needed.

Child's age (at baseline) had a strong impact on various study outcomes. Most notably, 3-year olds' BMI and BMI z-score decreased, albeit non-significantly, while both 4- and 5-year olds' increased. These changes in weight status may be indicative of when obesity prevention efforts should be initiated, beginning no later than 3-years of age.

This study has several strengths and limitations. Due to the limited number of obesity prevention efforts conducted with 3-to 5-year old children, this study contributes to the body of literature in terms of the intervention type; assessment measures; and factors impacting weight status, motor ability, physical fitness, and

physical activity of preschoolers. Because this study was conducted with a low-income, high Hispanic population, data presented here are not generalizable to preschoolers as a whole. Next, while the study population is representative of the state Head Start population, there may have been some selection bias as to who signed up for the study. Some families may have declined to participate because of low-literacy (not understanding the consent form) or immigration status.

Use of objective measures of physical activity, gross motor ability, and physical fitness is an additional strength of this study. Assessments with young children are difficult and prone to error; however, with the number of measures which were conducted with each child, researchers are confident that adequate measures of children's physical abilities were obtained. Furthermore, to the best of the authors' knowledge, this is the first study to use pedometers to measure physical activity as an outcome measure in an intervention study with preschool-aged children. Daily step counts found in this study were similar to findings by Cardon and De Bourdeaudhuij, illustrating the potential use of pedometers in population and intervention studies.<sup>35</sup> Because pedometers could not be sealed, there is an increased chance of premature resetting as well as reporting bias. The pedometers were difficult to open for adults, thus, most young children could not open them. Moreover, physical activity (pedometers) assessment was conducted during the months of October and April. In some parts of Colorado, particularly those areas at high elevation, weather at these times is very unpredictable, thus it may have had an impact on physical activity levels. Lastly, while the response rate for returning pedometer packets was quite good, the number of subjects in which physical activity

data was collected is far less than the number of subjects in which on-site gross motor and fitness assessments were conducted.

Next, several limitations existed with data collection. Some preschoolers' had more difficulty in demonstrating skills, particularly fitness skills, due to this age groups' cognitive immaturity and short attention spans. For instance, running between cones did not always occur in a straight line. Researchers controlled for this as best they could. Additionally, with data collected at eight different Head Start centers, facilities to conduct gross motor skill and physical fitness assessment varied. Assessments were conducted either in a gymnasium, a hallway, or the outside playground. Regardless of location, distractions were many (e.g. peers, dandelions, gym equipment). While this could be controlled for at pre- to post-testing, it could not totally be controlled by location. Lastly, classroom teachers were used to facilitate program activities on a daily basis, allowing for future sustainability of the program and potential for increased expansion efforts.

## **Conclusion**

Obesity rates among children continue to rise and the need for programs addressing the preschool audience is clear. Good nutrition and physical activity are important to the growth, development, and emotional well-being of young children and to their establishment of healthful lifestyles which can prevent childhood overweight. The success of *Mighty Moves*<sup>™</sup> at increasing gross motor skills and physical fitness in preschoolers, in concert with *Food Friends*<sup>®</sup> demonstrated ability to increase children's willingness to try new foods, has contributed to the establishment of healthful behaviors for proper growth and development in the early years. These

behaviors serve as foundations to building healthy lifestyles, which may decrease the risk of overweight later in childhood as well as adulthood. Longitudinal studies are needed to examine the potential impact of these behaviors on weight status over time.

**Table 7-1:** Child Characteristics at Baseline by Treatment Group

Characteristic	Experimental			Control		
	n	% or Mean	SD	n	% or Mean	SD
<b>Age at study entry (months)</b>	<b>96</b>	52.46	7.13	<b>105</b>	51.73	6.50
<b>Gender (%)</b>	<b>96</b>			<b>105</b>		
Male	56	58.3		53	50.5	
Female	40	41.7		52	49.5	
<b>Ethnicity (%)</b>	<b>96</b>			<b>105</b>		
Asian	1	1		0	0	
African American	2	2.1		4	3.8	
Hispanic	59	61.5		56	53.3	
Caucasian	28	29.2		36	34.3	
Other/Multi	6	6.3		9	8.6	
<b>Anthropometric Measures</b>	<b>96</b>			<b>105</b>		
Height (cm)		102.69	6.56		102.21	5.05
Weight (kg)		17.55	3.25		17.33	2.71
BMI		16.55	1.83		16.53	1.65
BMI z-score		0.74	0.93		0.67	0.99
<b>CDC Weight Classification (%)</b>	<b>96</b>			<b>105</b>		
Overweight (>95%)	13	13.5		11	10.5	
At risk for Overweight (85.0-94.9%)	24	25		23	21.9	
Normal Weight	57	59.4		70	66.7	
Underweight (<5%)	2	2.1		1	1	

**Table 7-2:** Mean Scores and T-Tests for Pre- and Post-Assessments within Treatment Group

Measures	Intervention Group				Control Group			
	n	Pre Mean ± SD	Post Mean ± SD	<i>p</i> (pre- post-difference)	n	Pre Mean ± SD	Post Mean ± SD	<i>p</i> (pre- post-difference)
<b>Body Mass Index</b>								
BMI	96	16.55 ± 1.83	16.74 ± 1.96	0.02	105	16.53 ± 1.65	16.45 ± 1.73	0.24
BMI z-score	96	.61 ± 1.07	.74 ± .93	0.02	105	.67 ± .99	.66 ± .99	0.23
<b>Gross Motor Skills</b>								
Gross Motor Quotient <sup>*</sup>	89	93.58 ± 9.17	99.31 ± 9.07	<.0005	98	93.74 ± 7.72	93.24 ± 9.02	0.57
Stability Skills <sup>**</sup>	94	9.9 ± 2.2	10.8 ± 1.96	0.001	101	10.16 ± 2.19	9.53 ± 2.09	0.02
Locomotor Skills <sup>**</sup>	94	9.22 ± 1.8	10.4 ± 1.9	<.0005	101	9.32 ± 1.50	9.61 ± 1.95	0.08
Object Manipulation Skills <sup>**</sup>	89	7.65 ± 1.91	8.54 ± 1.8	<.0005	98	7.5 ± 1.48	7.55 ± 1.61	0.79
<b>Physical Fitness</b>								
Sit-n-Reach (inches) <sup>†</sup>	95	28.39 ± .45	29.02 ± .53	0.17	104	28.68 ± 3.92	28.74 ± 4.33	0.89
Shuttle Run (time)	94	22.36 ± .60	19.65 ± .35	<.0005	102	21.69 ± 4.72	18.45 ± 2.61	<.0005
3-Minute Run (laps) <sup>†</sup>	92	25.11 ± .63	26.71 ± .51	0.01	102	26.16 ± 5.21	25.38 ± 5.03	0.19
<b>Physical Activity</b>								
Mean Step Count - All Days	46	10018 ± 3160	9891 ± 5094	0.86	55	9849 ± 3903	11261 ± 6451	0.11
Mean Step Count - Week Days	46	9570 ± 2974	9415 ± 5101	0.83	55	9378 ± 3482	10776 ± 6328	0.12
Mean Step Count - Weekend Days	46	10914 ± 4809	10876 ± 5746	0.97	53	10356 ± 4771	12118 ± 7408	0.08

No significant differences existed between groups at pre-test

\*Quotient Normative Score (mean ± SD) = 100 ± 15

\*\* Subtest Normative Score (mean ± SD) = 10 ± 3

† Higher scores are desired

**Table 7-3:** Difference in Post-Test Scores between Groups: Controlling for Classroom, Ethnicity, Gender, Age, and BMI z-score

Measures	Intervention Group		Control Group		Difference by Treatment		Covariate Significance (p-values)				
	n	Post Mean ± SD	n	Post Mean ± SD	F value	p value	Class-room	Ethnicity	Gender	Age	BMI z-score
<b>Body Mass Index</b>											
BMI	96	16.74 ± 1.96	105	16.45 ± 1.73	0.47	0.49	0.81	0.67	0.40	0.24	
BMI z-score	96	.742 ± .93	105	.662 ± .99	0.34	0.56	0.86	0.60			
<b>Gross Motor Skills</b>											
Gross Motor Quotient*	89	99.31 ± 9.07	98	93.24 ± 9.02	10.58	0.001	0.58	0.70	0.68	<.0005	0.002
Stability Skills**	94	10.8 ± 1.96	101	9.53 ± 2.09	15.58	<.0005	0.15	0.85	0.22	<.0005	<.0005
Locomotor Skills**	94	10.4 ± 1.90	101	9.61 ± 1.95	4.12	0.04	0.59	0.14	0.86	0.02	0.03
Object Manip. Skills**	89	8.54 ± 1.80	98	7.55 ± 1.61	1.76	0.19	0.42	0.34	0.01	0.21	0.81
<b>Physical Fitness</b>											
Sit-n-Reach (inches)†	95	29.02 ± 5.21	104	28.74 ± 4.33	4.72	0.03	0.03	0.29	<.0005	0.34	0.43
Shuttle Run (time)	94	19.65 ± 3.36	102	18.45 ± 2.61	37.45	<.0005	<.0005	0.95	0.12	<.0005	0.04
3-Minute Run (laps)†	92	26.71 ± 4.86	102	25.38 ± 5.03	7.33	0.01	<.0005	0.71	0.14	<.0005	0.001
<b>Physical Activity</b>											
Mean Step Count - All Days	46	9891 ± 5094	55	11261 ± 6451	2.14	0.15	0.29	0.44	0.82	0.79	0.31
Mean Step Count - Week Days	46	9415 ± 5101	55	10776 ± 6328	3.31	0.07	0.17	0.46	0.98	0.54	0.19
Mean Step Count - Weekend Days	46	10876 ± 5746	53	12118 ± 7408	0.29	0.59	0.84	0.44	0.83	0.90	0.59

No significant differences existed between groups at pre-test for paired data, thus post-test only was used in ANOVA tests.

\*Quotient Normative Score (mean ± SD) = 100 ± 15

\*\* Subtest Normative Score (mean ± SD) = 10 ± 3

† Higher scores are desired

**Table 7-4:** Change within Intervention Group in BMI, Gross Motor Skills, Physical Fitness by Age and Weight Status

Measures	Age*						Weight Status**			
	3 year olds (n=28)		4 year olds (n=51)		5 year olds (n=15)		normal weight (n=56)		overweight (n=46)	
	Mean Difference± SD	p- value	Mean Difference± SD	p- value	Mean Difference± SD	p- value	Mean Difference± SD	p- value	Mean Difference± SD	p- value
<b>Weight Status</b>										
BMI <sup>†</sup>	-.29 ± .93	0.11	.34 ± .59	<.0005	.62 ± .71	0.005	.16 ± .58	0.04	0.06 ± 1.04	0.71
BMI z-score <sup>†</sup>	-.12 ± .60	0.3	.25 ± .50	0.001	.21 ± .37	0.05	.18 ± .44	0.00	.07 ± .27	0.24
<b>Gross Motor Skills</b>										
Gross Motor Quotient	9.08 ± 9.54	<.0005	6.65 ± 8.73	<.0005	-2.87 ± 8.37	0.21	7.09 ± 10.01	<.0005	1.55 ± 9.02	0.26
Stability Skills	2.43 ± 2.81	<.0005	.47 ± 1.99	0.10	-.53 ± 2.48	0.42	1.18 ± 2.84	0.00	-.17 ± 2.44	0.64
Locomotor Skills	1.71 ± 2.07	<.0005	1.26 ± 2.21	<.0005	-.07 ± 1.49	0.87	1.34 ± 2.34	<.0005	.77 ± 1.7	0.003
Object Manipulation Skills	.64 ± 1.96	0.12	1.51 ± 1.99	<.0005	-.73 ± 2.63	0.30	1.13 ± 1.86	<.0005	.36 ± 2.53	0.35
<b>Physical Fitness</b>										
Sit-n-Reach (inches)	1.64 ± 6.04	0.16	.15 ± 3.44	0.75	.40 ± 3.70	0.68	1.29 ± 4.44	0.03	-.21 ± 4.03	0.73
Shuttle Run (time) <sup>†</sup>	-4.27 ± 7.13	0.004	-2.05 ± 3.06	<.0005	-2.06 ± 2.98	0.02	-3.17 ± 5.04	<.0005	-3.33 ± 5.62	<.0005
3-Minute Run (laps)	2.34 ± 5.3	0.03	2.08 ± 6.35	0.03	-1.54 ± 5.47	0.31	1.68 ± 5.57	0.03	1.39 ± 6.26	0.14

\*Age categories were defined by child's age at baseline in months: 3 year old (36-47.9); 4 year old (48-59.9); 5 year old (60-71.9).

\*\*Child's weight status was defined by CDC weight categories at pre-test: Normal weight  $\geq 5\%$  and  $< 85\%$ ; Overweight  $\geq 85\%$

<sup>†</sup> Negative differences are desired

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## CHAPTER 8

### DISCUSSION, CONCLUSIONS, AND FUTURE RECOMMENDATIONS

#### Discussion

Social marketing provided a framework in which *Food Friends Get Movin' with Mighty Moves™* was developed and evaluated.<sup>1</sup> Social marketing is often described as a consumer-focused planning framework which positions the target audience at the center of data collection, program development and program delivery in an effort to change behavior.<sup>2,3</sup> The consumer orientation element of the marketing framework places an emphasis on understanding the target audiences' behaviors, attitudes, values, practices, and beliefs.<sup>4</sup> Throughout the six steps of social marketing, and in turn the six steps of this project, a consumer focus was maintained by continually returning to teachers and children to get their reaction and point of view in the development and assessment of *Food Friends Get Movin' with Mighty Moves™*.

This project illustrates how each of the six steps of social marketing - Initial Planning, Formative Research, Strategy Development, Program Development and Pretesting, Implementation, and Evaluation – were addressed and applied to an obesity prevention program for preschool-aged children.

### ***Initial Planning***

With the prevalence of overweight continuing to rise among preschool-aged children, interventions focusing on this population are needed. Unfortunately, a void in obesity prevention efforts aimed at this age group exists. Obesity prevention programs for preschoolers can provide early experiences with foods and flavors, help develop healthy food preferences, monitor rate of weight increases to prevent early adiposity rebound, and provide child and parent nutrition education.<sup>5, 6</sup> In addition, programs can expose preschoolers to age- and developmentally-appropriate physical activities that explore new movements and enhance motor skill development.<sup>7</sup>

While it is believed that parental influence is a key modifiable factor in increasing children's physical activity, the childcare setting is also a strong predictor of activity levels of young children. The time spent in childcare can be extensive when both parents are working. It is estimated that 40 percent of children aged 3 to 4 years of age whose mothers are employed spend more than 35 hours per week in non-parental care.<sup>8</sup> Thus, Head Start and preschool centers offer untapped opportunities to implement effective obesity-prevention strategies to reach both children and parents.<sup>9</sup>

After careful review of the literature, the goals and objectives of this research project were developed and refined. One of the goals of this project was to determine if a physical activity program, in conjunction with an existing nutrition program, could decrease the upward trajectory of weight gain, as measured by body mass index (BMI), in low-income, minority preschoolers. Further, a secondary goal of the project

was to explore if the *Mighty Moves*<sup>™</sup> program could improve physical activity, gross motor skills, and/or physical fitness levels in 3- to 5-year old children enrolled in Head Start.

### ***Formative Research***

After a health-related problem was identified, the target audience was critically analyzed to ascertain their values, attitudes, opinions, interests, learning characteristics, occurrence of targeted behavior, and preferred media outlets. The social marketing process emphasizes that to develop an effective program intervention, researchers must understand what drives, facilitates, and maintains the behavior of the target audience, as well as the channels of information distribution and communication preferred by the target audience.<sup>10</sup>

Key informant interviews and focus group discussions were conducted with secondary influencers, teachers and parents, respectively. Because of their roles as gatekeepers in offering and encouraging physical activity in two selected places, the preschool classroom and home environment, they provided insight into preschool-aged children's needs, wants and preferences. Physical activity practices, beliefs, barriers, and desired materials for teachers and parents of preschool-aged children were identified. Results of formative research were then used to drive the development of a marketing strategy for both the classroom and parent components of *Mighty Moves*<sup>™</sup>. These strategies were intended to steer the development, implementation, and tracking of the program.<sup>1</sup>

### ***Strategy Development***

Strategy development involved the preparation of a realistic marketing plan comprised of specific, measurable objectives. The plan was organized around marketing's conceptual framework of the 4 P's: product, price, place and promotion.<sup>11</sup> Based on the themes and outcomes from the formative research, it was determined that the product, or desired behavior, for *Mighty Moves*<sup>™</sup> would be to enhance preschoolers' gross motor skills, physical fitness, and physical activity levels through increased opportunities. Because of requirements and environment offered by Head Start, in conjunction with the success of the *Food Friends*<sup>®</sup> program in this setting, it was decided that the place would continue to be the Head Start center. The price represents the barriers identified during the interviews. Time, space and equipment were identified by teachers as costs that would likely keep them from offering physical activity opportunities in the classroom. For children, the cost of participating in physical activity may be that some children, particularly those who are shy, physically disabled, or overweight; feel uncomfortable and/or awkward in doing so.

Further, it was determined that promotion of the product would utilize and expand the existing *Food Friends*<sup>®</sup> concepts and characters. Materials would be designed to capture children's imaginations and engage them in dramatic play while also taking into account developmental and age appropriateness. Teachers would be provided with lessons and activities prepared for them and which supported the Head Start Child Outcomes Framework.<sup>12</sup> Necessary materials and equipment to support lessons and activities would be provided to teachers for use in their classroom. Lastly, a hands-on training would be offered to teachers as part of the program.

### ***Program Development and Pretesting***

Social marketing can be viewed as a planning framework that incorporates behavior change theory within the context of consumer orientation. The integration of behavior change theory and social marketing strategies has great potential to effectively facilitate the bottom-up development, implementation, and evaluation of theory-driven, health-related educational and behavioral-change program.<sup>13</sup> Theory indicates what needs to be done to change behavior and social marketing provides direction for how to change the behavior. The synergistic value of overlaying theory into social marketing efforts allows health educators to better identify consumer values, and hence better reach the target audience.<sup>13</sup>

Constructs of the Social Learning Theory were applied throughout the development of lessons and supporting materials of *Mighty Moves*<sup>™</sup>, as well as to the teacher training and process evaluation instruments. The construct of reciprocal determinism provided the cornerstone in the development of *Mighty Moves*<sup>™</sup> as the program was designed to facilitate an interaction among children, children's level of physical activity and motor development, and the environment in which children were active. Children were provided with materials, time and opportunities within the classroom to participate in daily physical activity which taught, reinforced, and built motor skills. Classrooms provided safe and supportive physical and social environments for movement exploration during structured and unstructured free/play time.

To engage children's imaginations in a fun and exciting way, several creative concepts were devised. Graphics depicting each of the *Food Friends*® characters participating in different physical activities were developed. These activities represented different motor skills, which were presented to children as *Mighty Moves*™. In addition to having a *Mighty Move*, each character also had a superpower. Children could use their *Mighty Moves*™ and superpowers, along with the *Food Friends*®, to assist community members in the town of Healthadelphia™. Graphics, creative concepts, and program components were pretested with children and teachers. Input from children, teachers, and early childhood specialists greatly contributed to strategy refinement, solidification of the exchange principle, and program development, thus increasing the likelihood that the intervention would affect the desired behavior change, or product.

### ***Implementation***

The implementation stage of the social marketing process includes enlisting collaborators, training key players, and disseminating program/campaign materials.<sup>14</sup> *Food Friends Get Movin' with Mighty Moves*™ was a randomized controlled trial targeting 3- to 5-year children enrolled in Colorado Head Start centers. Eight Head Start centers (4 rural and 4 urban) who had previously implemented the *Food Friends*® nutrition program were recruited to participate. The *Mighty Moves*™ physical activity intervention was conducted in 4 of the Head Start centers. It was 18 weeks in length and was conducted in the classroom 4 days a week for 15-20 minutes each day, for a total of 72 lessons. Prior to the start of the study, teachers in the treatment group were trained on program implementation and the study

procedures, and provided with materials. Teachers in the control group were also trained but only on study procedures.

### ***Monitoring and Evaluation***

Monitoring and evaluation activities continue throughout the program implementation to identify any necessary program revisions, as well as to understand program effectiveness and make midcourse corrections as needed.<sup>15</sup> In this study, both process and outcome evaluation assessments were conducted with the children and teachers.

### ***Process Evaluation***

The *Mighty Moves*<sup>TM</sup> program was well accepted among teachers with high average rankings (5=ideal and 1=least ideal) for activities (mean=4.00, SD=.94) and materials (mean=4.27, SD=.56). Further teachers reported high levels of interest among children (mean=4.02, SD=.76) and children's participation (mean=3.96, SD=.75).

For theory-based physical activity interventions, strategies are often developed to impact constructs posited to be mediators of behavior change.<sup>16</sup> However, little work has been done to assess and understand the moderators and mediators of behavior change so that psychometric properties of these interventions can be improved to enhance the programs' overall effectiveness.<sup>16, 17</sup> Process evaluation in this study demonstrated that while self-efficacy increased immediately after the training, it was not sustained throughout implementation of *Mighty Moves*<sup>TM</sup>, suggesting that additional training sessions may need to be added to the program. Further,

associations between personal characteristics of teachers – BMI, ethnicity, education, and age of children in the classroom - and program rankings and teacher confidence were found. Teacher characteristics and self-efficacy, along with other constructs of the Social Learning Theory, are potential mediators of the desired behavior changes in young children. Understanding the mediators to these behavior changes may help to improve the overall effectiveness of the *Mighty Moves*<sup>™</sup> program.

### *Outcome Evaluation*

#### Baseline characteristics

Characteristics of the study population indicated a high prevalence of overweight, low physical activity levels, and average to below-average motor skills. Based on CDC classification, 13.3% of participants were overweight and 23.9% were at risk for overweight, thus 37.2% were above normal weight. These numbers are similar to NHANES data but much higher than Colorado WIC data for 2- to 5-year old children.<sup>18, 19</sup>

While adults have been shown to over-estimate the level of physical activity of youth, most data support the conclusion that the majority of children tend to be physically inactive.<sup>29</sup> To the best of the authors' knowledge, only one other study has reported daily step counts in preschool-aged children.<sup>20</sup> Cardon and De Bourdeaudhuij found that preschoolers averaged 9,980 steps per day. The present study found comparable average daily step counts, 9,509 per day, with no significant differences found by gender, age, ethnicity, or weight status. Cardon and De Bourdeaudhuij, in correlating preschoolers' daily steps counts (pedometer) to accelerometry minutes of

Moderate to Vigorous Physical Activity (MVPA), determined a daily step count of 13,874 equated to 1-hour of MVPA. With 1 hour of MVPA being the recommended amount of daily physical activity for children, their study found that only 8% of the children reached this number of daily steps.<sup>20</sup> Using their cut point in the current study, 7% (n=13) of children reached this threshold, supporting Cardon and De Bourdeaudhuij's conclusion that activity levels in preschool-aged children is low. With recent studies validating pedometer steps with direct observation and accelerometry in young children, it can be concluded that pedometers provide valid measures of daily physical activity levels in this age group.<sup>20-23</sup>

#### Impact of Intervention

This study did not see significant differences in BMI or BMI z-score at post-intervention, when controlling for covariates. Two intervention studies, Hip-Hop to Health Jr. and MAGIC, had the same objective as this study, decreasing weight gain, but with conflicting results.<sup>24, 25</sup> MAGIC did not see significant changes between treatment groups at 6-month follow-up.<sup>25</sup> Conversely, Hip-Hop to Health Jr. did not see a significant difference in weight gain between treatments at post-intervention but did see significant changes at 1 year follow-up.<sup>24</sup> Hence, reassessing weight gain at 1-year post-intervention for the current study population may be needed to see a change in weight status.

The *Food Friends Get Movin' with Mighty Moves*<sup>TM</sup> intervention did lead to significant changes in gross motor abilities when compared to the control group but did not lead to changes in physical activity. These findings suggest that the dose of classroom programming was adequate for gross motor enhancement but may not have been

for physical activity. The improvement in motor ability for this age group is important, as many children never develop certain mature patterns of motor skills and as a result they perform poorly as they grow older. These early failures can damage the child's self-esteem as well as lead to avoidance of movement. Children with low motor skills know that they can't move efficiently, they feel awkward, uncoordinated, and inhibited, thus leading to decreased movement.<sup>7</sup>

### **Conclusions**

The methodology and strategies used in the development of the *Food Friends Get Movin'* with *Mighty Moves*<sup>™</sup> program component of the *Food Friends*<sup>®</sup> social marketing campaign, can serve as examples for others working with similar audiences, topics, and issues. Social marketing, with the addition of a behavior-change theory, is viable tool for developing and evaluating obesity prevention programs.

As mentioned throughout this project, there is an obvious void in the literature when it comes to obesity prevention efforts for the preschool audience. An additional void is in the arena of objective physical activity measures for this age group.

Assessments with young children are difficult and prone to error because of their cognitive immaturity, short attention spans and vast range of developmental abilities. In this study, a large number of outcome variables, in addition to physical activity, were assessed in an effort to measure physical abilities which may contribute to physical activity levels. While pedometers appear to be a valid and reliable measurement tool to assess physical activity in preschoolers, more research is needed to establish normative values for daily step counts.

The success of *Mighty Moves*<sup>™</sup> at increasing gross motor skills and physical fitness in preschoolers, in concert with the *Food Friends*<sup>®</sup> program's demonstrated ability to increase children's willingness to try new foods, has contributed to the establishment of healthful behaviors for proper growth and development in the early years. These behaviors serve as foundations to building healthy lifestyles, which may decrease the risk of overweight later in childhood and throughout adulthood.

### **Future recommendations**

This project is an initial step in addressing overweight in the preschool population. While its findings contribute to the literature by providing daily step count data as well as additionally information on the relationships between weight status, gross motor skills, physical fitness, and physical activity, modifications to assessment measures are warranted. There were two limitations in this study's assessment ability which should be modifiable. The first is the study's inability to record a true ceiling in many 5-year olds gross motor ability. The finding that 5-year olds did not significantly improve in gross motor skills may be attributed to the inability of the PDMS-2 to establish a ceiling in older 5-year old children. Secondly, both treatment groups, regardless of age, gender, or weight status, improved significantly in the shuttle-run. Because of the cognitive immaturity of preschoolers, this test may not have been valid in measuring agility and speed from baseline to post-test with just one trial. Administering two trials, with a practice/demonstration run prior to recording results, may improve the tests validity. In terms of recommendations for physical activity assessment, future studies may want to record daily step counts

differently as to differentiate between activity levels during the school day versus activity levels in the home environment.

Further recommendations to enhance outcome results would be to include a 1 year follow-up to assess if differences in gross motor skills and physical fitness were maintained by the treatment group. Additionally, based on the finding of Hip-Hop to Health Jr., it may be advantageous to measure weight status 1 year post-intervention. Ideally, a longitudinal study would follow participants in both *Food Friends*® and *Mighty Moves*™ to assess if behaviors were maintained over time.

There are several recommendations specific to improving the *Food Friends Get Movin'* with *Mighty Moves*™ program. First, based on the results from the process evaluations, it is apparent that efforts to enhance or maintain teacher confidence need to be improved. One suggestion would be to add a training session at the mid-implementation point. This session would serve as a refresher to program goals and objectives as well as an opportunity for teachers to share their challenges and successes with peers and program staff. A further recommendation for teacher training would be to increase the emphasis on gross motor development. Because the *Mighty Moves* training was the first training on physical activity and motor development for many, more emphasis on how to teach motor development may be helpful. Next, changes and modifications to lessons and activities in the *Mighty Moves* program, based on teacher feedback, are critical to continuing to incorporate the target audiences input the program as improve the overall program. Despite questions about the length of the program, it appears that 18 weeks is the length needed to improve gross motor skills and fitness. Thus, the 18-week length should be maintained.

Lastly, outcome results presented here are an initial step in evaluating the impact of *Food Friends Get Movin' with Mighty Moves™* on the preschoolers' weight status, gross motor skill ability, physical activity and physical fitness levels. Future analysis should include examining the outcome data by teacher and classroom characteristics as well as examining the impact of parents' weight status, physical activity levels (steps counts), physical activity habits, and the home environment on child outcomes.

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## APPENDICES



Office of Regulatory Compliance  
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and Information Technology  
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MEMORANDUM

TO: Jennifer Anderson, FSHN, 1571  
FROM: Janell A. Meldrem, Administrator  
Human Research Committee  
SUBJECT: **PROJECT APPROVAL**  
Title: Food Friends and Fun Moves: A Creative Approach to Obesity Prevention for  
Preschool Children and Families  
Protocol No.: 05-070H  
Funding Agency: USDA-NRI  
DATE: April 8, 2005

The above-referenced project was approved by the Human Research Committee on April 6, 2005 for the period April 6, 2005 to March 24, 2006 with the condition that the attached consent form is signed by the subjects and each subject is given a copy of the form. It is the investigator's responsibility to obtain this consent form from all subjects. *NO changes may be made to this document without first obtaining the approval of the Committee.*

**Approval is for 125 key informant teacher interviews and focus groups with 96 parent participants.**

**Approval is for PHASE I only: material for PHASES II and III will be submitted for review and approval prior to implementation.**

A status report of this project will be required within a 12-month period from the date of approval. Renewal is the Principal Investigator's responsibility, but as a courtesy, you will be sent a reminder approximately two months before the protocol expires. The Principal Investigator will report on the numbers of subjects who have participated this year and project-to-date, about problems encountered, and provide a verifying copy of the consent form or cover letter used. The necessary form (H-101) is available from the Regulatory Compliance web page (see below). Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

It is the responsibility of the investigator to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research. It is also the investigator's responsibility to notify the Committee of any changes in experimental design, participant population, or consent procedures or documents. This can be done with a memo which completely describes the changes and their consequences (new consent form or cover letter, or altered survey instrument, for example). Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project. Upon completion of the project, an H-101 should be submitted as a close-out report.

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647. If approval did not accompany a proposal when it was submitted to a sponsor, it is the researcher's responsibility to provide the sponsor with the approval notice.

Please direct any questions about the Committee's action on this project to me for routing to the Committee.

Attachment  
cc: Laura Bellows w/attachment  
Sue Gould w/attachment

### Key Informant Interview

Hello, my name is \_\_\_\_\_ and I am a researcher at Colorado State University. You recently agreed to participate in an interview regarding physical activity. Is this still a good time for you? (If not, when would be a good time to reschedule?). Great. Thank you for agreeing to participate. The purpose of this project is to find out information for developing a physical activity program in preschools. We will ask you about how you think this should be done.

The interview will take about 45 minutes. When you finish, you will receive \$20 and entry into a drawing for \$100.

This project is for education research only. We do not think answering these questions will harm you in any way. All of your answers will be private and used only for research purposes. No one will see or use your name or other identifying information with your answers or in any reports. You may choose to have the interview audiotaped. This will help ensure that we catch everything that you say. No one but the researchers will be able to listen to you on the tape. The tape will be stored in a locked place. It will be erased after writing the reports. Is it okay if I tape record our conversation? Also, your participation is voluntary. You may stop at any time without loss of benefits.

#### Questions

1. How much longer is school in session for you?
  - a. Probe for summer plans/trips
2. How many years have you been teaching preschool?
  - a. Probe for years at current site
3. How many children do you have in your class? Is it full day or half day?
4. What types of physical activity do you enjoy?
5. Does your school offer physical activity programs to kids? Parents? Staff?
  - a. Probe for distinction from unstructured recess.
6. What physical activities, rhythmic movements, and games, do you currently do with your class?
  - a. Probe for frequency and duration
    - How often? ( such as how many times per week)
    - How long are the sessions?
  - b. Probe for names of structured curricula they may be using either as a resource or for teaching.
  - c. How do activities differ throughout the school year?
    1. Probe for seasons –fall, winter, spring, summer
  - d. Are any kids in your class receiving Physical Therapy or Occupational Therapy (group activities)?

Appendix B: Key Informant Question Set

7. What do you think about the amount of physical activity in your classroom?
  - a. Probe for interest in more or less
  - b. Probe for perceived benefits and costs of physical activity.
  - c. Probe for their interest in having quality physical activity time with children
  - d. Probe for interest in delivering 'sufficient' amounts of physical activity
  - e. Probe for their perception of student' response and parents' response.
    - How often do you think students would want to have physical activity? (such as how many times per week and for how long for each session)
    - How often do you think parents would want to have physical activity for their children? (such as how many times per week and for how long for each session)
  
8. If a structured physical activity program were to be conducted in your classroom what would you want it to look like?
  - a. Probe for frequency, duration, type
    1. How often? (such as how many times per week)
    2. How long should the sessions last?
    3. When would it be convenient to offer PA during the school day?
      1. Probe before/after meal, before/after recess, during group time, a little here and there throughout the day
    4. How can activity be tied into things that you are already doing in the classroom?
      1. Probe for thoughts on movement morsels, school readiness, as a separate activity.
  
9. What things would make it easier for you to teach structured physical activity?
  - Probe for details (time, training, assistance, materials, priority, equipment, space, experience, etc.)
  
10. What are the barriers to teaching structured physical activity with your preschoolers?
  - a. Probe for details (time, priority, equipment, space, experience, etc.)
    - Do you have adequate indoor space for teaching physical activity?
    - Outdoor space?
    - Does your site have equipment for teaching physical activity?
    - Is there adequate storage space for equipment?
    - Does this differ by season?
  
11. Have you ever participated in the Funsical Fitness program? If so, what are your opinions about the program?
  - a. Probe for likes and dislikes
  
12. Have you conducted the Food Friends program in your class? If so, how many years have you done so?
  
13. We are interested in developing a physical activity component for the Food Friends program. What do you think about that?

Appendix B: Key Informant Question Set

14. What suggestions do you have as to how we can use the Food Friends characters to weave physical activity into the school day?
  - a. Probe for what types of activities the characters may be shown doing (i.e. Ollie on a skateboard, Rudy with a jump rope, etc)?
  - b. What types of activities should they promote (Ollie Says; Radish, Radish, Cheese)?
15. Let's talk a bit about training. What type of training have you received for leading physical activity for preschool?
  - a. Probe for what was helpful and what was not.
16. What would you like to see in staff training for teaching physical activity?
  - a. Probe for barriers & fears they may have.
  - b. Probe for what similar components of Food Friends trainings they would want or not want in the training.
17. How do you involve parents in children's education presently? How are parents involved in children's physical activity?
  - a. Probe to see what works and what doesn't as far as family involvement
18. What do you think about the name of the program should be called?
  - a. Probe for thoughts on
    1. Get Movin' with the Food Friends
    2. Food Friends and Healthy Moves
    3. Movin' and Groovin' with the Food Friends
    4. Fit and Fun with the Food Friends
    5. Stomp, Romp and Role with the Food Friends
    6. Wiggle and Giggle with the Food Friends

## Focus Groups

### Introductory Script

Hello and Welcome. I am glad that you could join us for a discussion on Health and Preschoolers. My name is \_\_\_\_\_ and I am from Colorado State University. I will be leading today's discussion that will help researchers at CSU better understand your thoughts on health and your preschool child. Joining me today is \_\_\_\_\_, also from CSU.

We encourage all of you to participate and **share your views and opinions**. Remember, there are **no right or wrong answers**, only differing points of view. Feel free to say what you think, even if it differs from what has already been said.

Today's discussion will be **tape recorded** so that we can capture your thoughts and your own words. We will not record your name so there will be no connection between what you say and your name.

Your participation in the focus group is completely voluntary. If at any point, you do not want to continue participating, that is okay. You will still be **compensated** for your time.

### Questions

1. Let's get acquainted and go around and have everyone give their **name** and one or two things that **you like to do with your preschooler**.
  
2. How does your **preschooler fill their time** at home?
  - a. Probe: How do you feel about this?
  - b. Probe: What types of things would you like them to be doing at home?
  
3. When it comes to **health and your preschooler** what comes to mind?
  - a. Probe: What are your thoughts about healthy eating? Physical activity? Regular doctor visits? Dental? Immunizations? Chronic disease prevention? Obesity?
  
4. (*skip to 5 if PA was mentioned in 3*) I hear some of you mentioning **chronic diseases** such as diabetes and heart disease, what types of things do you think can prevent these diseases?
  - a. Probe: What are your thoughts about healthy eating? Physical activity?
  
5. Some of you mentioned being active as a factor for good health. Let's talk a bit about that. What is **important about physical activity for your preschooler**?
  
6. What **types** of physical activity do your **preschoolers participate** in?
  - a. Probe: How long do they participate in each of these activities? (duration)

Appendix C: Focus Group Question Set

- b. Probe: How often do they do these activities? (frequency)
  - c. Probe: How often do you or your spouse/partner participate in these activities with your preschooler?
7. How do you feel about the **amount** of physical activity that your **preschooler** participates in **each day**?
  - a. Probe: Do you feel that it is the 'right amount'? 'More than most kids their age'? 'Less than most kids their age'?
  - b. Probe: How much PA do you think is the 'right amount' for preschoolers?
  - c. Probe: How likely are you to participate in regular PA with your preschooler?
8. What type of things would be **helpful for you to engage** your **preschooler** in *more* PA?
  - a. Probe: Would you be interested in written materials? PA equipment? Musical CDs/tapes?
  - b. Probe: What type of things should be on the written materials? What type of PA equipment would be most helpful? Would you prefer a tape or CD?
9. What **barriers** might there be for your **preschooler** to participate in physical activity?
  - a. Probe: Would time be an issue? Equipment? Space? Safety of playing outdoors? Accessibility to parks or playgrounds? Others?
10. Now let's talk about you for a bit. What **types** of physical activity do **you** participate in?
  - a. Probe: How long do you participate in each of these activities? (duration)
  - b. Probe: How often do you do these activities? (frequency)
  - c. Probe: To what extent do other family members participate with you?
11. What would make it **easier** for **you** to **participate** in physical activity (without your child)?
  - a. Probe: Time? Child Care? Location? Others to participate with you? Others?
  - b. Probe: If classes were offered, which settings would make it easier for you to participate in PA? Head Start/preschool? Church? Community Center? Schools? Cooperative Extension Office? Others?
  - c. Probe: What types of activities would be of interest? Walking club? Aerobics? Tai chi? Others?
  - d. Probe: What are some other barriers to participating in PA?
12. We are interested in developing a program for preschoolers and families that adds physical activity into the existing Food Friends program. Your child recently participated in Food Friends and has been introduced to the characters (show puppets) – Ollie Orange, Tina Tortilla, Marty Milk, Corrine Carrot, Howie Hamburger, Gertie Gouda, and Rudy D. Radish. What suggestions do you have as to **how we can use** these **characters** to promote physical activity?
  - a. Probe: What types of activities should they promote?

Appendix C: Focus Group Question Set

- b. Probe: What types of activities would you have the characters be shown doing (i.e. Ollie on a skateboard, Rudy with a jump rope, etc)?
13. What do you think about the **name** of the program should be called?
- a. Probe for thoughts on
    - i. Get Movin with the Food Friends
    - ii. FF and Healthy Moves
    - iii. Movin and Groovin with the Food Friends
    - iv. Fit and Fun with Food Friends
    - v. Stomp, Romp and Roll with Food Friends
    - vi. Wiggle and Giggle with Food Friends
  - b. Probe for other ideas
14. Does anyone have any other thoughts or comments that they would like to share with us?

Summary:

Thank you for taking the time to talk with us tonight about Preschoolers and Physical Activity. Your thoughts and opinions are very important to us. They will help guide us in the development of a physical activity program for preschoolers and parents in Colorado as well as nationally.

## Participant Information Sheet

*Please check the category that describes you.*

**Age:**

- 18-34 years
- 35 – 44 years
- 45-59 years
- 60-74 years

**Gender:**

- Male
- Female

**Ethnicity:**

- White
  - Black or African American
  - Hispanic or Latino
  - American Indian or Alaska Native
  - Asian
  - Native Hawaiian and Other Pacific Islander
  - Some other race
- 

*Please place the number of people in your home on each line below.*

**Number of adults in household:**

- Adults (18 and older)

**Number of children in household:**

- Birth to 2
- 3 to 5 years old
- 6 to 18 years old

001 28 2005



Office of Regulatory Compliance  
Office of Vice President for Research  
and Information Technology  
Fort Collins, CO 80523-2011  
(970) 491-1553  
FAX 491-3293

**Notice of Human Research  
Amendment Approval**

**Principal Investigator:** Jennifer Anderson, FSHN, 1571  
**Co-Principal Investigator:** Laura Bellows, FSHN, 1571  
**Title:** Food Friends and Fun Moves: A Creative Approach to  
Obesity Prevention for Preschool Children and Families  
**Protocol #:** 05-070H  
**Committee Action:** Amendment Approved: October 20, 2005  
**HRC Administrator:** Janell Meldrum *Janell Meldrum*

The Human Research Committee reviewed and approved your request to amend the above-referenced project. The approved amendments are below.

**Amendment(s):**

- to implement Phase II which consists of additional funding for Phase II from DHHS Head Start Bureau;
- using various scripts to describe the activities to the children and parents,
- using a cover letter to inform the parents of the activities the child will be asked to do, leaving it up to the child if they want to participate or not. Consent has been waived through §\_\_ 110(d);
- using a signed consent form for the teacher participants for the "program design & teacher feedback" and the "lesson pretesting with teachers and children"

**Condition(s):**

- that the final instruments are submitted for review and approval prior to use.

**Investigator Responsibilities:**

- it is the responsibility of the PI to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research.
- it is also the PI's responsibility to notify the Committee of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

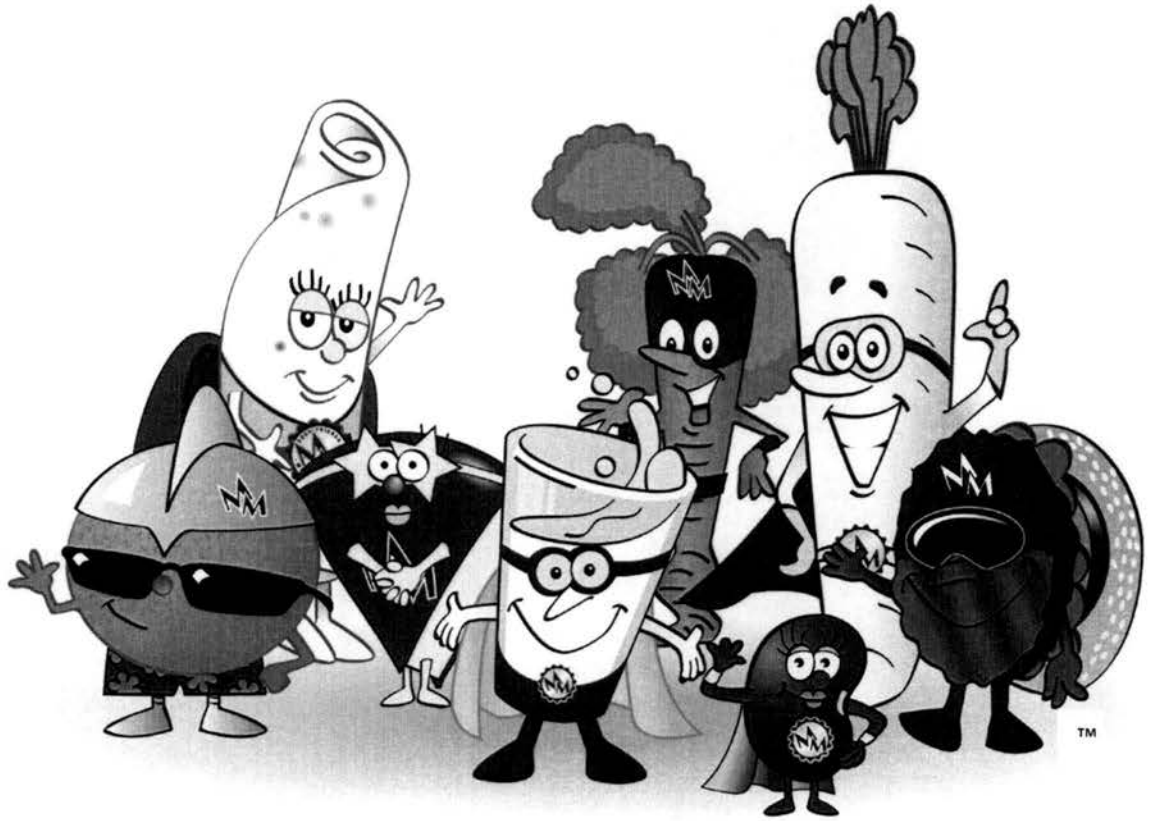
This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647.

If you have questions, please contact me at 1-1555 or [janell.meldrum@colostate.edu](mailto:janell.meldrum@colostate.edu).

Attachments to PI & Co-PI

Date of Correspondence: 10/25/05

Appendix E: Final Group Graphic



**Pretesting Script and Recording Sheet– 1<sup>st</sup> Round**

Hello, child name.

We would like to talk to you about the Food Friends. We are going to ask you some questions and show you some pictures that are about being active. This will take about 10 minutes. If, during the project you want to stop, that's OK too –just let me know, OK. Is this something you'd like to do?

Child's Name, **Have you seen the Food Friends before?**

Yes \_\_\_\_\_ No \_\_\_\_\_

Characters - Now, I'm going to show you some pictures.

- **Can you tell me which one you like best? What do you like about it?** (Repeat 8 times until child comments on all characters; place number next to # and like/dislike next to #).
- Ollie # \_\_\_\_\_ \* \_\_\_\_\_ Marty # \_\_\_\_\_ \* \_\_\_\_\_
- Gertie # \_\_\_\_\_ \* \_\_\_\_\_ Howie # \_\_\_\_\_ \* \_\_\_\_\_
- Tina # \_\_\_\_\_ \* \_\_\_\_\_ Corrine # \_\_\_\_\_ \* \_\_\_\_\_
- Rudy # \_\_\_\_\_ \* \_\_\_\_\_ Bonnie # \_\_\_\_\_ \* \_\_\_\_\_
- Is there anything else that you would like to tell me about these pictures?

Characters with Activities - I'm going to show you some more pictures. This time the characters are doing different activities called Mighty Moves.

**Do you like the name Mighty Moves?** Yes \_\_\_\_\_ No \_\_\_\_\_

- **Can you tell me what this character is doing?**
- **Can you tell me how much you like this activity by pointing to a face?** The smiley face means that you really like it, the flat smile means it's so-so, and the sad face means that you don't like it.

Tina: Activity:

Rudy: Activity:

Marty: Activity:

Corrine: Activity:

Bonnie: Activity:

Gertie: Activity:

Ollie: Activity:

Howie: Activity:

_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️
_____ 😊	_____ 😐	_____ ☹️

- **Do you want to have Mighty Moves like them?** Yes \_\_\_\_\_ No \_\_\_\_\_
- **Which of these characters do you like the best?**
- **Which do you like the least?**
- **Are there other Mighty Moves (activities) that you would like to see them doing (i.e. soccer, skateboarding)?**

Mighty Moves Picture – I have one last picture to show you.

**Do you like all of the Food Friends together like this?** Yes \_\_\_\_\_ No \_\_\_\_\_

**What do/don't you like?**

Appendix F: Questions for Graphic Pretesting – 3 Phases

**Pretesting Round 2**

Age: \_\_\_\_\_

Gender: \_\_\_\_\_

Ethnicity: \_\_\_\_\_

**For each character ask:**

This is \_\_\_\_\_, can you tell me what s/he is doing? Do you like to \_\_\_\_\_ (fill in activity)?

Ollie Orange: \_\_\_\_\_

Gertie Gouda: \_\_\_\_\_

Rudy D Radish: \_\_\_\_\_

Which of these 2 pictures do you like best?

Soccer \_\_\_\_\_ Basketball \_\_\_\_\_

Corrine Carrot: \_\_\_\_\_

Which of these 2 pictures do you like best?

Twisting \_\_\_\_\_ Hoop \_\_\_\_\_

**For Bella/Bonnie Bean**

Can you tell me what she is? \_\_\_\_\_

What type of activity is she doing? \_\_\_\_\_

What should we name her? Do you like Bella Bean? \_\_\_\_\_ Do you like Bonnie Bean? \_\_\_\_\_

\_\_\_\_\_

**Pretesting Round 3**

Age: \_\_\_\_\_

Gender: \_\_\_\_\_

Ethnicity: \_\_\_\_\_

**For each character ask:**

This is \_\_\_\_\_, can you tell me what s/he is doing?

Do you like to \_\_\_\_\_ (fill in activity)?

Gertie Gouda: \_\_\_\_\_

Which of these 3 pictures do you like best? \_\_\_\_\_ balance \_\_\_\_\_ soccer \_\_\_\_\_ walking

Rudy D Radish: \_\_\_\_\_

Which of these 3 pictures do you like best? \_\_\_\_\_ bat \_\_\_\_\_ soccer \_\_\_\_\_ basketball

**For Bella/Bonnie Bean**

Can you tell me what she is? \_\_\_\_\_

What type of activity is she doing? \_\_\_\_\_

What should we name her?

Do you like Bella Bean? \_\_\_\_\_

Do you like Bonnie Bean? \_\_\_\_\_

## Appendix G: Teacher Group Discussion Questions

Hello. My name is Laura Bellows and I am from Colorado State University. I am here today to ask you some questions about the Food Friends program, specifically, the physical activity component, Mighty Moves, that we are currently developing.

Last summer we interviewed a number of Head Start and preschool teachers about their thoughts and opinions on physical activity and preschoolers. We also spoke with lots of parents to get their input as well. From that information we have begun to develop Mighty Moves. Before going any further, we feel that it is really important to get teacher feedback and input into the design.

So, today I'll give you a bit of background, tell you our current plan, and show you some examples. Throughout, I would really appreciate your honest feedback, whether positive or negative, so that we can make Mighty Moves the best program possible. Sometimes negative thoughts are more helpful than the positive so please feel free to share. If you have to leave early, that is fine. You will still be compensated for your time.

**Question:** Could we go around and have everyone introduce themselves and how long you've been teaching preschool?

**Q1:** How many of you have conducted Food Friends in your classrooms?

Great! Let me start with telling you a bit more about the background of Mighty Moves and how we envision it working with the existing Food Friends program.

### **What Mighty Moves currently looks like:**

The program will be 18 weeks long with Food Friends being conducted during the final 12 weeks. An activity is scheduled for each day for 15 minutes to contribute to physical activity recommendations for preschoolers. Mighty Moves will use a superhero theme to engage children's imagination and encourage physical activity. Music and various pieces of equipment will be provided to enhance activities. Suggestions for reinforcing gross motor skills throughout the day will also be provided.

### **PROVIDE GRAPHIC and OUTLINE**

**Q2:** What do you think about the graphics? the superhero theme?

**Q3:** How often do you conduct structured physical activity in the classroom with your students?

**Q4:** What are your thoughts on the length of the program? 18 weeks? 4 days/week? 15 minutes per day?

**Q5:** What suggestions do you have for making the length and duration of the program work in your classroom schedule?

Let's talk a bit about how Mighty Moves materials will be provided to you. Just like Food Friends, Mighty Moves materials will come 'packaged'. Lessons will be outlined and provided to you as a curriculum/activity outline. I've provided you with several examples of other preschool physical activity programs. Please take a minute to review them and then let's take a look at these together and go through them one by one.

### PROVIDE LESSON OUTLINES

For each one:

**Q6:** What do you like about this? Layout, content, amount of information, teaching cues

**Q7:** What do you think is missing?

**Q8:** How would you like the activity outline to be packaged? Binder/clipboard, bound, box, etc.

At the end of each week, for review, children will be using their imaginations to take them on journeys. To try to tie the nutrition and activity message together, the journeys will be to the farmers market, farm, orchard, grocery store, picnic, county fair, garden.

**Q9:** What do you think of those types of places for the journeys?

**Q10:** For other activities, what do you think of the concept of having kids visit and pretend to 'help out' at community sites like the firehouse, airport, park, hardware store, etc?

Music! We will be developing our own original music for Mighty Moves, including a Food Friends and Mighty Moves theme song. Music will be created for the journeys and, hopefully, some other pieces to show kids tempo, beat, and cultural music.

**Q11:** I'm interested in hearing about what types of music you already have in your classroom?

**Q12:** Do you feel like you have enough music? Could you describe what types you have?

**Q13:** Could you use some of your existing music for background music for Mighty Moves activities?

**Q14:** Do you all have CD players? Do the speakers work appropriately?

In addition to the activity outline and music, equipment will be provided for each classroom. Currently, we are considering polyspots, beanbags, balls, scarves, balloons, balls (maybe beach), climbing rope.

**Q15:** What are your thoughts on the current equipment list? **PROVIDE LIST**

**Q16:** Are there other things that you might like to have included? Cones, hoops, etc.

**Q17:** Would storage be an issue?

**Q18:** Would you be willing to blow up balloons or beach balls? Would you use a pump?

In order to build gross motor skills and competency in physical movements, repetition and practice are required.

**Q19:** How do you think this could be accomplished in the classroom? Center time? Outdoor play?

Since we have a few minutes left, I want to get your opinion on some other superhero ideas.

I have a list of superhero characteristics and physical abilities that will be incorporated into the program. **PROVIDE LIST.**

**Q20:** What are some additional ideas that you have for superhero abilities?

**Q21:** What do you think about the message 'Trying new foods gives you mighty moves'?

## Appendix H: Teacher Feedback Questions

Thank you for reviewing the lessons for Mighty Moves. While reviewing please think about the following questions and provide a brief summary of your thoughts for each of the questions:

1. What do you think of the layout?
  - Do you like the way it looks?
  - Is it easy to read?
2. What do you think of the content?
  - Is it easy to understand the lesson objectives/purpose?
  - Do you like what the lessons teach?
3. What do you think of the themes represented in lessons?
  - Do you think the lessons relate well to the themes?
4. What do you think of the duration and frequency of lessons/activities?
  - Do you think lessons or activities are too long? Not long enough?
5. What do you think of the supporting materials?
  - Do you think they will help teach the lesson/activity?
6. What do you think of the program and materials in general?
  - Do you think it will be easy to offer this program?
  - What do you think would make it easier to offer this program?
  - What do you think would make this program better?
7. Please add other thoughts or comments – general or specific to a single lesson.

Thank you very much for your feedback. If you have any additional comments, please let us know. Your thoughts and opinions are very important in developing a program to help get children active!

# **MIGHTY MOVES™**

## **Weekly Outline**

- Week 1: Food Friends Get Movin' with Mighty Moves
- Week 2: Bella's Bound for Fun
- Week 2.5: Bella's Bound for Fun (continued)
- Week 3: Corrine's Incredible Expedition
- Week 4: Gertie's Great Getaway
- Week 5: Ollie's Awesome Outing
- Week 6: Ollie's Awesome Outing (continued)
- Week 7: Marty's Marvelous Adventure
- Week 8: Howie Hits the Town
- Week 9: Tina's Terrific Tour
- Week 10: Rudy's Rockin' Road Trip
- Week 11: Bella's Bound for MORE Fun
- Week 12: Corrine's EXTRA Incredible Expedition
- Week 13: Gertie's Great NEW Getaway
- Week 14: ANOTHER Awesome Outing with Ollie
- Week 15: MORE OF Marty's Marvelous Adventures
- Week 16: Howie Hits the Town, AGAIN!
- Week 17: Tina's Terrific Tour – TIMES TWO
- Week 18: ROUND 2 of Rudy's Rockin' Road Trip

## Lesson Overview: Moving In My Balloon

---

### Movement Concepts

- Personal and Shared Space
- Locomotor Skills

### Learning Objectives

Children will:

- Practice moving in Personal Space
- Explore Shared Space
- Develop Locomotor Skills

### Head Start Domain(s)

*Language Development: Listening and Understanding*

- Demonstrates increasing ability to attend to and understand conversations, stories, songs and poems.

*Social and Emotional Development: Self-Control*

- Develops growing understanding of how their actions affect others.

### Equipment Required

- 🎵 Mighty Moves Musical CD (and CD player).
- Mighty Moves Polyspots
- Optional: Background music

### Lesson Description

Children will explore various locomotor skills in their personal and shared space.

#### Concept(s):

*Shared Space* – Shared Space is the space encompassing the entire play area.

Children will learn to move throughout this space without unnecessarily touching other children.

#### To conduct the lesson you will need to:

1. Read the Activities on the opposite page and become familiar with the activities.
2. Scatter polyspots throughout the classroom. One for each child
3. Conduct the activities in *Moving in My Balloon* with your students.
  - 🎵 Play the Mighty Moves Theme Song. Lead children through the movements.
  - *Around and Around We Go*
  - *Up, Up and Away*

## **Lesson: Moving in My Balloon**

---

### **Activities**

#### **A. ♪ Mighty Moves Theme Song (Track 1)**

Play the Theme Song to build familiarity and to get kids excited about Mighty Moves activities.

#### **B. Around and Around We Go**

We are going to get back in our balloons today. On 3 – 1, 2, 3 – everyone blow up their balloons.

1. If you have the same color spot as yesterday, stretch your hands high over your head? If you have a different color spot stretch your hands out to the side? Now everyone go up and now out to the side.

2. Today we are going to move around inside of our balloon and explore our personal space. Remember the traffic light – green is go, red is stop and yellow is go home. Can you \_\_\_\_\_ around your spot? \_\_\_\_\_ around the other way? \_\_\_\_\_ around your spot # times?

- Walk
- March
- Gallop
- Skip
- Hop
- Skate

#### **C. Up, up and Away**


Do you remember how I told you that there are two kinds of spaces. The first is personal space – moving around inside of your balloon like we just did. The other kind is called shared space. Shared space is space that everyone can move in. We can move around the room in our shared space but we need to respect each others personal space and not touch each other.

We are now going to float around the room in our balloons. Put your hands out to side and let's walk around the room in our balloon. Remember - don't touch anyone or anything.



Continue to have children move throughout the room. Use traffic light to switch movements:



- Walk
- March
- Gallop
- Skip
- Hop
- Skate



**Mighty Moves™ – Character Introductions**



Graphic	Mighty Moves and Superpowers	Musical CD Character Introductions
	<p><b>Food Friends Get Movin with Mighty Moves</b>            Meet the Food Friends - Ollie Orange, Tina Tortilla, Gertie Gouda, Marty Milk, Corrine Carrot, Rudy D. Radish, and Howie Hamburger. Together with Bella Bean, they all love to move and have special skills. The Food Friends call these skills Mighty Moves. When the Food Friends use their Mighty Moves, they gain superpowers that make them healthy and strong.</p> <p>The Food Friends' Mighty Moves take them on journeys throughout the town of Healthadelphia. In Healthadelphia they use their Mighty Moves to help others in their community. We are going to go on many journeys with the Food Friends and practice our own Mighty Moves so we can gain superpowers like them.</p>	<p><b>Theme Song</b>            We're the Food Friends            You know our names            Tina, Corrine, Bella, Gertie            Come play with us            Marty, Howie, Rudy and Ollie</p> <p>When you're hungry for fun            And thirsty for adventure            When you're starving for something to do,            We're the ones to look for            C'mon and join our crew!</p> <p>We're the Food Friends            and you know that when you're with us            the fun never ever ends            We've got mighty moves.            We've got funky songs.            C'mon and boogie with us.            Bring all your friends along.</p> <p>Can't sit still gotta move! (Dance! Jump!)            Got places to go, gotta move! (Twist! Stretch!)            Time for fun, gotta move! (Skip! Throw!)            Feelin' mighty? Gotta move!</p> <p>We might look like ordinary food,            stuff you'd see on the table            But when the time is right, you'll see our might,            and all the things we're able            to do. And you can too!            We've got super powers and mighty moves.            We've got lots of friends and awesome tunes.</p>

		<p>C'mon with us and play, the Mighty Moves way.</p> <p>We'll go on exciting journeys We'll meet lots of new friends, will you be one? On an adventure with the Food Friends You'll have a bellyful of fun!</p> <p>C'mon and join the Food Friends, We want to share our moves with you. Come with us we're the Food Friends, We're mighty and so are you!</p> <p>With friends like us you'll never be hungry With friends like us, life is always yummy Food Friends!</p>
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Graphic	Mighty Moves and Superpowers	Musical CD Character Introductions
	<p><b>Bella's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Bella has great rhythm and loves to dance. Dancing to different kinds of music is her favorite thing to do.</li> <li>• Bella knows body parts. She can move her arms, legs, and hips in all different ways.</li> <li>• She also is the queen of space. Bella gives herself and those around her space to move.</li> </ul> <p><b>Bella's Superpower</b> Mind Reading</p>	<p>I'm <b>Bella Bean</b> and when I'm on the scene, you can't keep a secret from me! My super power lets me read your mind. It's called telepathy.</p> <p>I love to dance, love to boogie and wiggle, I shake my arms and my legs and my tiny beanie middle. I've got the rhythm, I've got the groove. Come dance with me, let's bust a move!</p>
	<p><b>Corrine's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Corrine can make her body into different shapes. She stretches, twists, turns and bends.</li> <li>• Corrine is also good at balancing, especially while she moves.</li> </ul> <p><b>Corrine's Superpower</b> X-ray Vision</p>	<p>I'm <b>Corinne Carrot</b> and my x-ray vision eyes let me see through everything let me know what's inside. I can see through walls I can see in the dark. I can see under water and in the belly of a shark! Come with me, and I'll tell you what I see!</p> <p>I'm a carrot who can twist. I'm a veggie who can bend. When you're in the mood to move, I'm your twistin' bendin' friend. I can twist like macaroni, I can bend like I'm spaghetti. If you're itchin' for some twistin,' this carrot's always ready.</p>

Graphic	Mighty Moves and Superpowers	Musical CD Character Introductions
	<p><b>Gertie's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Gertie really likes to move - she walks, runs, marches and gallops.</li> <li>• She knows when to stop and go and can move in different directions. Gertie moves forward, backward, up, down, right, left, sideways, clockwise, and counterclockwise.</li> <li>• Gertie can also move her body at different levels - high, middle and low.</li> </ul> <p><b>Gertie's Superpower</b> Elasticity</p>	<p>My name is <b>Gertie Gouda</b>, and I'm no normal cheese, I'm an elastic chunk of fun that can reach whatever I please. My arms and legs are stretchy, I can take giant steps or small. And if my friends need a hug, a can wrap my arms around them all!</p> <p>I'm a cheese that's made for walkin, I'm a chunk that likes to stroll. If you wanna cover some ground, come join me on my Gouda patrol. I'm a creamy walking wonder, I can walk backward or step to the side. We can walk along forever, cause, for us walkers, the world's open wide</p>
	<p><b>Ollies' Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Ollie loves to move - he skips, skates side steps, and hops.</li> <li>• He can do this in different pathways such as straight, curved and zigzag. Ollie can also move in different speeds, like fast and slow.</li> <li>• Ollie takes on different roles. He leads, follows and does mirror images. He can move by himself (solo), with a partner, or as part of a group.</li> </ul> <p><b>Ollies' Superpower</b> Lightening Quickness</p>	<p><b>Ollie Orange</b> here, but if you don't look quick you're gonna miss me, dude. 'Cause I've got zip and I'm mighty hip, an orange flash of speed. I zoom around Healthadelphia in a citrus blast, My superpower's speed and man, I'm fast!</p> <p>I can skate and you can follow, or be the leader and I'll follow you. Let's skip in a zig-zag or in circles – loop-de-loops. I can run straight or run all twisty Orange you glad that you can too? If you feel like skipping or running, man set me loose, I got the juice!</p>

Graphic	Mighty Moves and Superpowers	Musical CD Character Introductions
 <p>A cartoon character of a glass of milk with a face, wearing a cape and glasses, holding two dumbbells.</p>	<p><b>Marty's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Marty is very strong. He can move with different forces - strong, medium, and light.</li> <li>• He is also good at balancing while staying in one place. He can move his weight from one body part to another.</li> <li>• Marty shows us that eating good foods makes us strong and healthy.</li> </ul> <p><b>Marty's Superpower</b> Super Strength</p>	<p>I'm <b>Marty Milk</b> and I'm super strong, Nothing's too heavy with me along. When there's things to lift or move out of the way, this glass of milk will save the day.</p> <p>I lift things that weigh a lot and things that don't weigh much I can walk, I can march and I can skip when I'm in a rush. This dairy strongman can balance in one place, and also stand real still I can do it on one foot and not move and not spill.</p>
 <p>A cartoon character of a hamburger wearing a helmet and goggles, riding a bicycle.</p>	<p><b>Howie's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Howie likes to be outside where he can ride his bike, swim, play at the park, and climb around the playground.</li> <li>• Howie moves to new places in various ways - near, far, under, over, on, off, in front, behind, together, apart, facing, side-by-side, around and through.</li> </ul> <p><b>Howie's Superpower</b> Transforming</p>	<p>I'm <b>Howie Hamburger</b> a lot more than meets the eye when you need a transformer, let me tell ya, I'm your guy. My sesame bun, I can paddle like a boat. With a parachute of lettuce, gently down to earth I float.</p> <p>This burger's a crazy biker, who likes to pedal to the park. On my bike I'm one speedy sandwich I go so fast you can see sparks! At the playground I can climb, crawl up those bars like a meaty monkey, Having fun outside's my gig, I'm an outdoor-playin' junkie.</p>

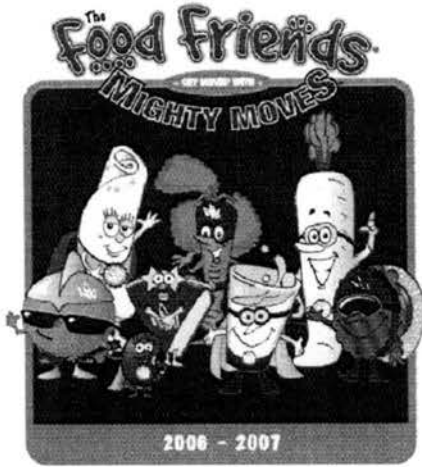
Graphic	Mighty Moves and Superpowers	Musical CD Character Introductions
	<p><b>Tina's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• Tina is great at jumping. She can jump high or long. Tina can also jump on, off, or over things.</li> <li>• She can jump on two feet or just on one foot.</li> <li>• Tina can also move her weight from one side to another.</li> </ul> <p><b>Tina's Superpower</b> Flying</p>	<p>I'm <b>Tina Tortilla</b> and I'm rarely on the ground I love to jump, jump, jump And hop up and down. And when I'm feeling mighty, there's something special I can do I can fly above Healthadelphia and I can take my friends along with me too.</p> <p>I can jump with both feet together And I can leap with legs apart I can land on my left foot without falling Bouncing around's my special art. Jumping over things makes me happy, Hopping along makes my heart sing, Pouncing and bouncing is what I live for, Jumping for joy is this tortilla's thing.</p>
	<p><b>Rudy's Mighty Moves</b></p> <ul style="list-style-type: none"> <li>• He throws, catches, dribbles, and kicks. He can do this with beanbags or balls. He can play baseball, soccer, basketball, tennis, and other sports.</li> <li>• Rudy also makes comparisons like higher, lower, smaller, bigger, faster, slower, greater, and less than.</li> </ul> <p><b>Rudy's Superpower</b> Being Invisible</p>	<p>I'm <b>Rudy Radish</b> and when I cover my eyes No one can see me. I'm invisible, that's why! I'm a disappearing daikon don't think you'll find me, cause you won't I'm a root with super powers, now you see me now you don't.</p> <p>This veggie's a ball player. I can catch and I can throw. I'm a pitcher with a passion for action. Gimme a ball and I'll put on a show. I'm radish who can kick, I'm a root who can dribble and run. I can do anything with a ball, baseball or soccer, it's all fun!</p>

Appendix L: *Mighty Moves*™ Materials List

*Mighty Moves* Material List

- Polyspots (Rubber Mats) – 20  
(8 characters, 4 colors)
- Musical CD (17 Tracks)
- Flashcards (8 large flashcards)
- Bella Bean Puppet
- Balls – kick (6, 1 of 6 colors), beach (10), yarn (6, 1 of 6 colors)
- Beanbags – 20 (6 colors)
- Scarves (20)
- Climbing Rope (2, 8 foot)
- Storybook
- *Mighty Moves* Certificate

Appendix M: Prototypes of Select *Mighty Moves*™ Materials



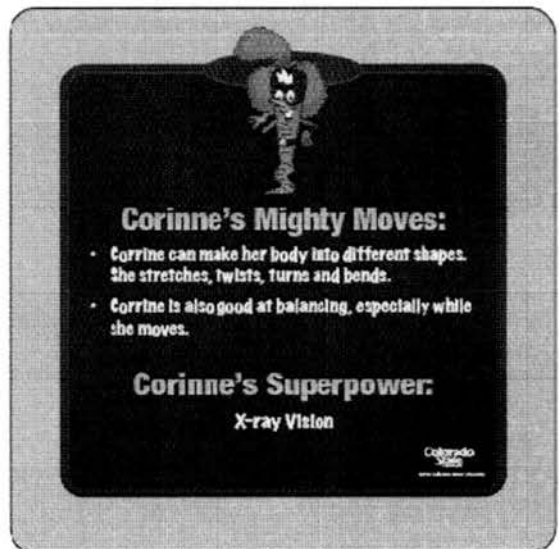
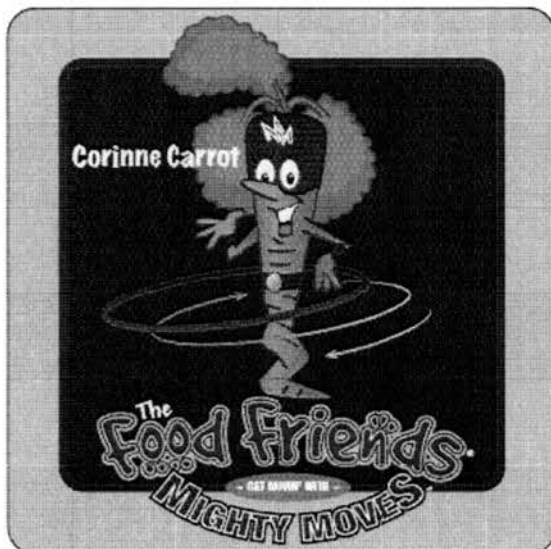
Activity Binder



Polyspot



Musical CD



Flashcard

# **MIGHTY MOVES™**

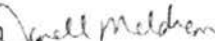
## **Musical CD**

- Track 1: Food Friends Get Movin' with Mighty Moves
- Track 2: Bella Bean Intro
- Track 3: Bella's Bound for Fun
- Track 4: Corrine Carrot Intro
- Track 5: Corrine's Incredible Expedition
- Track 6: Gertie Gouda Intro
- Track 7: Gertie's Great Getaway
- Track 8: Ollie Orange Intro
- Track 9: Ollie's Awesome Outing
- Track 10: Marty Milk Intro
- Track 11: Marty's Marvelous Adventure
- Track 12: Howie Hamburger Intro
- Track 13: Howie Hits the Town
- Track 14: Tina Tortilla Intro
- Track 15: Tina's Terrific Tour
- Track 16: Rudy D. Radish
- Track 17: Rudy's Rockin' Road Trip



Office of Regulatory Compliance  
Office of Vice President for Research  
Fort Collins, CO 80523-2011  
(970) 491-1553  
FAX: 491-2293

## Notice of Human Research Amendment Approval

**Principal Investigator:** Jennifer Anderson, FSHN, 1571  
**Co-Principal Investigator:** Laura Bellows, FSHN, 1571  
**Title:** Food Friends and Fun Moves: A Creative Approach to  
Obesity Prevention for Preschool Children and Families  
**Protocol #:** 05-070H  
**Committee Action:** **Amendment Approved:** July 20, 2006  
**HRC Administrator:** Janell Meldrem 

The Human Research Committee reviewed and approved your request to amend the above-referenced project. The approved amendments are below.

### **Amendment(s):**

- Approval for the amendment has the condition of obtaining the letters of cooperation from the participating head start centers prior to recruitment and submitting them to the HRC.
- To implement Phase III that will consist of an intervention study involving 8 head start centers and including 1200 children between the ages 3-5, 1200 parents/caregivers and 100 teachers.
- Compensation will be \$400 for each center participating in Food Friends & Mighty Moves; \$40 for family participation, \$100 for each teacher.
- The approved consent forms/cover letters for each group are to be used in the appropriate language - English or Spanish
- All other details of the procedures to be followed and forms to be used are outlined in the memo dated July 12, 2006.

### **Investigator Responsibilities:**

- It is the responsibility of the PI to immediately inform the Committee of any serious complications, unexpected risks, or injuries resulting from this research.
- It is also the PI's responsibility to notify the Committee of any changes in experimental design, participant population, consent procedures or documents. This can be done with a memo describing the changes and submitting any altered documents.
- Students serving as Co-Principal Investigators may not alter projects without first obtaining PI approval. The PI is ultimately responsible for the conduct of the project.

This approval is issued under Colorado State University's OHRP Federal Wide Assurance 00000647.

If you have questions, please contact me at 1-1655 or [janell.meldrem@colostate.edu](mailto:janell.meldrem@colostate.edu).

Attachments - to PI

Date of Correspondence: 7/21/06

## Food Friends Get Movin' with Mighty Moves Teacher Training Survey

Please circle the number that best reflects your opinion of the next questions. Feel free to add comments, especially to the areas that would help us improve the low ratings.

1. Prior to this training, I felt confident that I can teach Physical Activity in my classroom

1	2	3	4	5
Not Confident	A little Confident	Somewhat Confident	Confident	Very Confident

2. After this training, I feel confident that I can teach Physical Activity in my classroom

1	2	3	4	5
Not Confident	A little Confident	Somewhat Confident	Confident	Very Confident

3. I am confident that I can conduct Mighty Moves in my classroom.

1	2	3	4	5
Not Confident	A little Confident	Somewhat Confident	Confident	Very Confident

4. The training today was \_\_\_\_\_ for the Mighty Moves program.

- a. The right amount
- b. OK amount, but would have liked more
- c. A little too much
- d. Not necessary

5. What did you like best about today's training?

6. What did you like least about today's training?

---

7. How many years have you been teaching preschool? \_\_\_\_\_

8. Age \_\_\_\_\_

9. Gender: \_\_\_\_ Female                      \_\_\_\_\_ Male

10. Ethnicity:

- \_\_\_\_\_ White
- \_\_\_\_\_ Black or African American
- \_\_\_\_\_ Hispanic or Latino
- \_\_\_\_\_ American Indian or Alaska Native
- \_\_\_\_\_ Asian
- \_\_\_\_\_ Native Hawaiian and Other Pacific Islander
- \_\_\_\_\_ Some other race

**Food Friends and Mighty Moves Research Project: Teacher Survey A  
(Weeks 1-3)**

1. Of the activities listed below, please check the box that best describes what you think about each activity component.

			Rating Scale					
			Great	Good	OK	Not So Good	Poor	Did Not Do
Week	Lesson	Activity						
1	1: Food Friends Get Movin' with Mighty Moves	Introducing the Food Friends						
		Introducing Mighty Moves						
	2: Me in My Balloon	Body Parts						
		Personal Space						
	3: Moving in My Balloon	Around and Around We Go						
Up, up and away								
4: Mighty Moves	Mighty Moves in Healthadelphia							
2	1: Bella Bean's Mighty Moves	Bella Bean Overview						
		Bella's Body Parts						
	2: Body Parts and Shared Space	Body Parts						
		Shared Space						
	3: Cruising Healthadelphia's Main Street	Hand-y Moves						
Movin' on Main Street								
4: Bella's Bound for Fun	Sensing Fun ♪ Journey – Bella's Bound for Fun							
2.5	1: Bella Knows How You Feel	♪ Journey – Bella's Bound for Fun Experiencing Emotions						
	2: Traveling Throughout Healthadelphia	Planes, Trains and Automobiles						
3	1: Corrine Carrot's Mighty Moves	♪ Journey - Bella's Bound for Fun						
		Corrine Carrot Overview						
		Shapely Fun						
	2: Produce Paradise	Body Shapes						
		Fruits and Veggies Gone Wild						
	3: Harvesting Bella's Garden	Harvesting Bella's Garden						
	4: Corrine's Incredible Expedition	Shapes and Garden Critters						
		♪ Journey – Corrine's Incredible Expedition						

**Additional Comments** - Feel free to add comments, especially to the areas that would help us improve the low ratings.

Appendix Q: Teacher Process Survey – Weeks 1-3

1. From your observations, what activities did the children like the most? If possible, please include specific comments or actions that show this.
2. What activities did the children seem to dislike or resist participating in?
3. Of the activities that you did, which ones were most enjoyable for you to teach to the children? Why?
4. Of the activities that you did, which ones were least enjoyable for you to teach to the children? Why?

**Please circle the number that best reflects your opinion of the next questions.**

7. Do you feel the activities are?
- |                          |   |   |   |   |   |                          |
|--------------------------|---|---|---|---|---|--------------------------|
| Hard to do with the kids | 1 | 2 | 3 | 4 | 5 | Easy to do with the kids |
| Common and boring        | 1 | 2 | 3 | 4 | 5 | Unique and exciting      |
8. Are the activity directions:
- |                          |   |   |   |   |   |                     |
|--------------------------|---|---|---|---|---|---------------------|
| Very difficult to follow | 1 | 2 | 3 | 4 | 5 | Very Easy to follow |
| Very hard to understand  | 1 | 2 | 3 | 4 | 5 | Very Understandable |
9. How would you describe the children's overall interest in and excitement about Mighty Moves?
- |          |   |   |   |   |   |           |
|----------|---|---|---|---|---|-----------|
| Very low | 1 | 2 | 3 | 4 | 5 | Very high |
|----------|---|---|---|---|---|-----------|
10. The children's overall participation in the program is:
- |          |   |   |   |   |   |           |
|----------|---|---|---|---|---|-----------|
| Very low | 1 | 2 | 3 | 4 | 5 | Very high |
|----------|---|---|---|---|---|-----------|
11. How do you feel when teaching the activities to the children?
- |                  |   |   |   |   |   |                |
|------------------|---|---|---|---|---|----------------|
| Very unconfident | 1 | 2 | 3 | 4 | 5 | Very confident |
|------------------|---|---|---|---|---|----------------|

**Additional Comments** - Feel free to add comments, especially to the areas that would help us improve the low ratings.

**Please place in the provided envelopes and postmark by December 6<sup>th</sup> for your chance to earn an additional \$100!**

April 2006

Dear Parent(s) or Guardian(s):

Thank you for agreeing to participate in the Food Friends and Mighty Moves Pilot Study. Inside this packet you will find these items:

- **2 Pedometers.** One for your child (with the black strap attached) and one for you. We have included an extra strap if you would like to use it for yourself.
- ***Pedometer Instructions Sheet***
- ***Child's Physical Activity Log Sheet and Child's Pedometer Log Sheet***
- ***Parent's Pedometer Log Sheet***
- ***Physical Activity in Preschool Children Survey.***
- ***Food Friends Program Survey***
- ***Payment form.*** Each family will receive \$40 for participating - \$20 at the beginning of the study and \$20 at the end. Please fill out the form and a check will be sent to you.

When completed, please place your forms and the pedometers in the provided manila envelope. The envelope should be returned to your Head Start Teacher. If possible, please complete and return by **Thursday, May 10, 2007.**

If you have any questions, please feel free to contact Laura Bellows at 970.491.1305 or your Head Start center.

Thank you again for your time and participation in this study.

Sincerely,

Laura Bellows, MPH, RD  
Study Coordinator  
Specialist

Jennifer Anderson, PhD, RD  
Professor and Extension

## Food Friends and Mighty Moves: Instruction Sheet

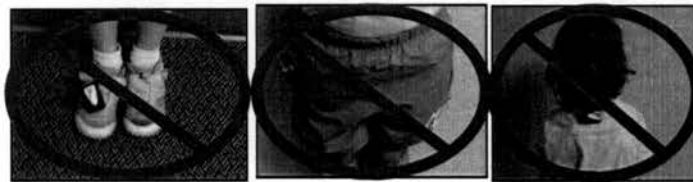
### Step 1: How You and Your Child Use the Pedometer

1. **Open** its cover and press the yellow “reset” button so that the **Steps** reads “00”.
2. **Close** the cover on the pedometer.
3. **Clip** the back of the pedometer onto waistband of pants, jeans, shorts, or skirt, next to the right front hip bone. If wearing a dress, pedometer can be placed on shorts that are worn underneath dress.
4. **Secure** pedometer to clothing with metal clasp.
5. **Wear** pedometer until going to bed at night.
6. **Remove** pedometer while sleeping at night
7. **Record** the number of steps child took on **Child Pedometer Log Sheet** and number of steps parent took on **Parent Pedometer Log Sheet**.

#### Correct Placement: On the Hip



#### Incorrect Placements: Shoe, Pocket, Back



**NOTE: If pedometer did not work, a new pedometer can be received from the teacher at your Head Start center.**

### Step 2: How to Fill Out Forms

1. **These three forms** need to be filled out each night for **4 weekdays and 2 weekend days**: (Instructions are on each form.)
  - a. *Child's Physical Activity Sheet*
  - b. *Child's Pedometer Log Sheet*
  - c. *Parent's Pedometer Log Sheet*
2. **Write anything extra** that relates to your or your child's day that may help clarify what you have recorded. Write these in the last row of the Pedometer Log Sheets labeled **“Notes”**.
  - \* *Examples include the following:*
    - a. Pedometer fell off and child didn't wear it for an hour.
    - b. Child played with the pedometer a lot today.
    - c. Child/I was ill today.
    - d. I went for a bike ride and didn't wear the pedometer.
  - \* *Please note anything you feel is important, however.*

### Step 3: How to Return the Forms

1. **Place** the forms and pedometers in the provided manila envelope.
2. **Return** envelope to your child's Head Start teacher.

**Questions?** Contact Laura Bellows at 970.491.1305.

Child ID \_\_\_\_\_

<b>Child's Pedometer Log</b>						
<i>Please record the exact number of steps your child took from when s/he got out of bed until s/he went to bed at night.</i>						
	<b>Weekday 1</b>	<b>Weekday 2</b>	<b>Weekday 3</b>	<b>Weekday 4</b>	<b>Weekend Day 1</b>	<b>Weekend Day 2</b>
<b>Day of the Week</b>						
<b>Number of Steps</b>						
<b>Notes</b>						

What is your child's height? \_\_\_\_\_ ( feet and inches)

What is your child's weight? \_\_\_\_\_  
(pounds)

Post

Appendix S: Peabody and Fitness Recording Sheet

Station Age	3 years old (36-47 months)	4 years old (48-59 months)	5 years old (60-71 months)
Items included in subtests			
1. Physical Fitness Testing/ Sit-ups, Push-ups, Somersault (No shoes for height, weight, and sit and reach)	<input type="checkbox"/> Shuttle Run ____(32.9ft) <input type="checkbox"/> 3 minute run ____(30ft) <input type="checkbox"/> Height____ <input type="checkbox"/> Weight____ <input type="checkbox"/> Sit and Reach____  <input type="checkbox"/> Item 28 ____ and 29 ____ <input type="checkbox"/> # of correct sit- ups ____ <input type="checkbox"/> Item 79 ____ <input type="checkbox"/> Item 30 ____	<input type="checkbox"/> Shuttle Run ____(32.9ft) <input type="checkbox"/> 3 minute run ____(30ft) <input type="checkbox"/> Height____ <input type="checkbox"/> Weight____ <input type="checkbox"/> Sit and Reach____  <input type="checkbox"/> Item 28 ____ and 29 ____ <input type="checkbox"/> # of correct sit-ups ____ <input type="checkbox"/> Item 79 ____ <input type="checkbox"/> Item 30 ____	<input type="checkbox"/> Shuttle Run ____(32.9ft) <input type="checkbox"/> 3 minute run ____(30ft) <input type="checkbox"/> Height____ <input type="checkbox"/> Weight____ <input type="checkbox"/> Sit and Reach____  <input type="checkbox"/> Item 28 ____ and 29 ____ <input type="checkbox"/> # of correct sit- ups ____ <input type="checkbox"/> Item79 ____ <input type="checkbox"/> Item 30 ____
2. Stationary	Start @ Item 23 (if cannot do go back to Item 20) <input type="checkbox"/> Item 23 ____ 25 ____ and 27 ____ <input type="checkbox"/> Item 24 ____ <input type="checkbox"/> Item 26 ____	Start @ Item 23 (if cannot do go back to item 20) <input type="checkbox"/> Item 23 ____ 25 ____ and 27 ____ <input type="checkbox"/> Item 24 ____ <input type="checkbox"/> Item 26 ____	Start @ Item 23 (if cannot do go back to item 20) <input type="checkbox"/> Item 23 ____ 25 ____ and 27 ____ <input type="checkbox"/> Item 24 ____ <input type="checkbox"/> Item 26 ____
3. Walking/Stairs (Locomotor)	Start @ Item 64 (if cannot do go back to Item 59) <input type="checkbox"/> Item 64 ____ 71 <input type="checkbox"/> Item 65 ____ 71  <input type="checkbox"/> Item 68 ____ and 70 ____ <input type="checkbox"/> Item 75 (if can) ____	Start @ Item 68 <input type="checkbox"/> Item 68 ____ and 70 ____ <input type="checkbox"/> Item 71 ____ <input type="checkbox"/> Item 75 ____ and 78 ____	Start @ Item 75 <input type="checkbox"/> Item 75 ____ and 78 ____
4. Hopping/Jumping (Locomotor)	Start @ Item 61 (if cannot do go back to Item 58) <input type="checkbox"/> Item 61 ____ 67 ____ and 76 ____ <input type="checkbox"/> Item 62 ____ <input type="checkbox"/> Item 63 ____ <input type="checkbox"/> Item 72 ____ <input type="checkbox"/> Item 73 ____ <input type="checkbox"/> Item 77 (if can) ____	Start @ Item 76 <input type="checkbox"/> Item 76 ____ and 81 ____ <input type="checkbox"/> Item 72 ____ <input type="checkbox"/> Item 73 ____ <input type="checkbox"/> Item 77 ____ <input type="checkbox"/> Item 82 ____ <input type="checkbox"/> Item 83 (if can)  <input type="checkbox"/> Item 84 (if can)	Start @ Item 81 <input type="checkbox"/> Item 81 ____ <input type="checkbox"/> Item 82 ____ <input type="checkbox"/> Item 83 ____ <input type="checkbox"/> Item 84 ____ <input type="checkbox"/> Item 87 ____ <input type="checkbox"/> Item 89 ____
5. Running (Locomotor)	Start @ Item 60 <input type="checkbox"/> Item 60 ____ and 66 ____ <input type="checkbox"/> Item 69 ____ (at same time of 66 if can)	Start @ Item 69 <input type="checkbox"/> Item 69 ____ (at same time as 3 minute run) <input type="checkbox"/> Item 74 ____ <input type="checkbox"/> Item 85 ____	Start @ Item 85 <input type="checkbox"/> Item 85 ____
6. Skipping/Galloping (Locomotor)	Not for 3 year olds (unless want to)	Start @ Item 80 <input type="checkbox"/> Item 80 ____ <input type="checkbox"/> Item 86 ____ <input type="checkbox"/> Item 88 (if can) ____	Start @ Item 80 <input type="checkbox"/> Item 80 ____ <input type="checkbox"/> Item 86 ____ <input type="checkbox"/> Item 88 ____

Appendix S: Peabody and Fitness Recording Sheet

7. Throwing/ Catching (Object Manipulation)	Start @ Item 8 <input type="checkbox"/> Item 8 ___ <input type="checkbox"/> Item 10 ___ <input type="checkbox"/> Item 11 ___ <input type="checkbox"/> Item 12 ___ <input type="checkbox"/> Item 14 ___ <input type="checkbox"/> Item 15 ___ <input type="checkbox"/> Item 17 (if can) ___ <input type="checkbox"/> Item 19 (if can)	Start @ Item 15 <input type="checkbox"/> Item 15 ___ <input type="checkbox"/> Item 17 ___ <input type="checkbox"/> Item 19 ___ <input type="checkbox"/> Item 22 ___ <input type="checkbox"/> Item 24 ___	Start @ Item 19 <input type="checkbox"/> Item 19 ___ <input type="checkbox"/> Item 22 ___ <input type="checkbox"/> Item 24 ___
8. Kicking (Object Manipulation)	Start @ Item 9 <input type="checkbox"/> Item 9 ___ <input type="checkbox"/> Item 13 ___	<input type="checkbox"/> Not needed	<input type="checkbox"/> Not needed
9. Target/Bouncing (Object Manipulation)	Start @ Item 16 <input type="checkbox"/> Item 16 ___ <input type="checkbox"/> Item 18 (if can) ___	Start @ Item 16 <input type="checkbox"/> Item 16 ___ <input type="checkbox"/> Item 18 ___ <input checked="" type="checkbox"/> Item 20 ___ <input type="checkbox"/> Item 21 ___	Start @ Item 18 <input type="checkbox"/> Item 18 ___ <input type="checkbox"/> Item 20 ___ <input type="checkbox"/> Item 21 ___
10. Kick outside (Object Manipulation)	Not for 3 year olds (unless want to)	<input type="checkbox"/> Item 23 ___	<input type="checkbox"/> Item 23 ___

- Directions for Administration/Scoring

- o Instructions may be stated up to 3 times to ensure maximum clarification
- o May need to administer item 2 of 3 times for optimal score as test indicates on instructions (if child loses interest, go on and then come back to it later)
- o General criteria for scoring items:
  - 2 – child performs item according to the criteria specified for mastery
  - 1 – child's performance shows a clear resemblance to the item mastery criteria but does not fully meet the criteria
  - 0 – child cannot or will not attempt the item, or the attempt does not show that the skill is emerging
- o Basal levels
  - Established when the child receives a score of 2 on 3 items in a row
  - The last 3 2's before the 1 or 0 = basal level
  - If child scores 1 or 0 on any of first 3 items administered from entry point, examiner should go backward until child scores 2 on 3 items in a row
  - All items below the basal are scored 2
- o Ceiling levels
  - Once basal has been established examiner administers progressively harder items until the child scores 0 on each of 3 items in a row = ceiling, testing discontinued on that subtest.
  - All items above ceiling are 0
- o Examiners should try to observe the following:
  - Child's interest in task
  - Child's approach to understand instructions
  - Child's approach to problem solving
  - Child's comments or nonverbal responses to tasks
  - Child's latency or perseveration of response
  - Child's use of self-corrections
  - Child's preferred hand use in grasping, throwing etc.
  - Child's directionality in transferring materials (left > right, right>left)
  - Child's smoothness, agility, and coordination in execution of motor movements
  - Child's ability to separate movements of one part of body from another
  - Child's extraneous or overflow activity prior to, during, or after performing an item
  - Child's feelings about their performance